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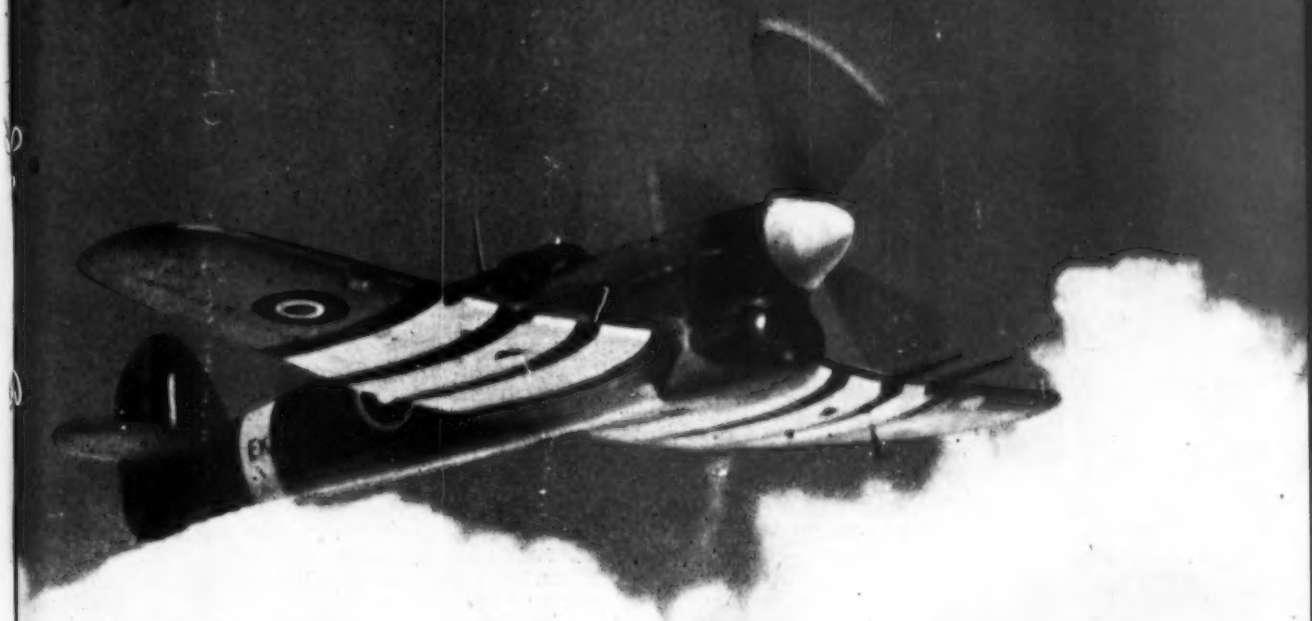

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Colour Photo by John Yoxall of "Flight"

Great Achievements . . .

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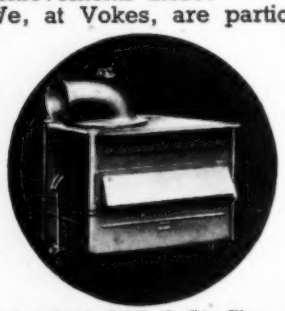

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FLIGHT and The AIRCRAFT ENGINEER

FIRST AERONAUTICAL WEEKLY IN THE WORLD : FOUNDED 1909

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Editorial, Advertising and Publishing Offices: DORSET HOUSE, STAMFORD STREET, LONDON, S.E.1
Telegrams: Truditur, Sedist, London. Telephone: Waterloo 3333 (35 lines).

COVENTRY: 8-10, CORPORATION ST. Telegrams: Autocar, Coventry. Telephone: Coventry 5210.
BIRMINGHAM, 2: GUILDHALL BUILDINGS, NAVIGATION ST. Telegrams: Autopress, Birmingham. Telephone: Midland 2971 (5 lines).
MANCHESTER, 3: 260, DEANSGATE. Telegrams: Iliffe, Manchester. Telephone: Blackfriars 4412.
GLASGOW, C.2: 26B, RENFIELD ST. Telegrams: Iliffe, Glasgow. Telephone: Central 4857.

Registered at the G.P.O. as a Newspaper.

No. 1800. Vol. XLIII. June 24th, 1943. Thursdays, One Shilling

The Outlook

Tactical Air Forces

A FEW days ago it was announced that two new Tactical Air Forces had come into being in the United Kingdom, one having been formed by the United States Army 8th Air Force and the other by the Royal Air Force. Both have been modelled on the force of the same name commanded by Air Marshal Sir Arthur Coningham in North-West Africa.

Air support for a British Expeditionary Force has always been recognised as one of the many duties of the Royal Air Force. In the inter-war years this duty was performed by providing a certain number of so-called army co-operation squadrons, equipped and trained solely for tactical reconnaissance up to about fifty miles behind the enemy's front line and for artillery observation. Their duties were studied and taught at a School of Army Co-operation. Within the limited sphere of work contemplated, these squadrons were very highly trained, and the pilots in them were extremely competent. When the Army held manœuvres a certain number of fighter and light bomber squadrons from the Command Air Defence of Great Britain were lent to the Army for the occasion. It did not seem adequate, but the War Office showed no perturbation.

The shortcomings of this arrangement were shown up during the campaign in France and the Low Countries, and it was obvious that something more adequate would have to be devised. The result was the formation in December, 1940, of the R.A.F. Army Co-operation Command, on the staff of which Army officers served side by side with R.A.F. officers. Among other activities the two Services combined cordially in developing airborne divisions. The other activities remained a close secret, if we except the use of Mustang fighters to shoot up trains in northern France, which was obviously a means of "blooding" the squadrons and had nothing to do with real co-operation.

The term "army co-operation" has become misleading, because it was originally applied to the tactical reconnaissance squadrons whose duties covered only a very small part of what the term ought to imply. It certainly ought to mean every form of help which aircraft can give to an Army in the field, in actually helping the ground troops to win battles. Doubtless it was the original intention that the A.A. Command should work to that end. The Command existed only in the United Kingdom, and the only way of judging its work was to study what happened in Africa, where it might be expected that the theories and practice evolved by the Command would be put into operation. The Middle East R.A.F. Command always received generous compliments from the Army of the Nile, but for a long time it did not succeed in contributing to a land victory on a decisive scale. There may have been many reasons for that, such as shortage of certain classes of aircraft, shortage on the Army's part of the right sort of tanks, and perhaps ideas which were not quite up to date.

However, from the Battle of Alamein onwards a change came over the scene, and it was clear that the Air Forces and the Army were working in much closer unison. Air Marshal Coningham's Western Desert Air Force obviously opened a new chapter in the history of air support for ground troops, and the new movement was developed and expanded when the same Air Marshal was given command of the Allied Tactical Air Force in Tunisia. Its operations have been acclaimed as a model, and in consequence the British and American organisations in the United Kingdom have been moulded to follow that model closely. The Army Co-operation Command vanishes (and one might almost add the time-honoured words) unwept, unhonoured and unsung.

Simplification

THE new Tactical Air Force of the R.A.F. has been placed under Fighter Command, and at first sight this may seem a little surprising. But it certainly simplifies matters to reduce the number of Commands and of Air Officers Commanding-in-Chief. There is always some risk of healthy rivalry developing into something less healthy. Fighter Command has now almost ceased to be Britain's first line of defence, for we have passed from a defensive to an offensive attitude. When next an Allied Army lands on the Continent it must first and foremost gain superiority in the air, and that is a matter for fighters. We can picture practically the whole of Fighter Command crossing the seas and getting to work from airfields on the mainland.

A spokesman of the Air Staff has stated that when the invasion of the Continent takes place every squadron which can be of use to the Army will lend its aid. That must mean practically all the light and medium bombers. It is, therefore, legitimate to guess that these will be removed from the charge of Bomber Command and become part of the Tactical Air Force. If so, Bomber Command will be left with its squadrons of heavy bombers, which are not suitable for close support of an Army, and will continue its battering of German production centres. In fact, one may foresee the present Bomber Command being transformed into a Strategical Air Force on the lines of General Doolittle's command in Tunisia.

Pantellaria

THE opinion expressed above, that heavy bombers are not suitable for tactical work with an Army, naturally calls to mind the surrender of Pantellaria after terrific bombardment from the air and from the sea. The understandable tendency of the British public will be to conclude that these two forms of preparatory attack are so effective that the reduction of a defended coast is a comparatively easy matter.

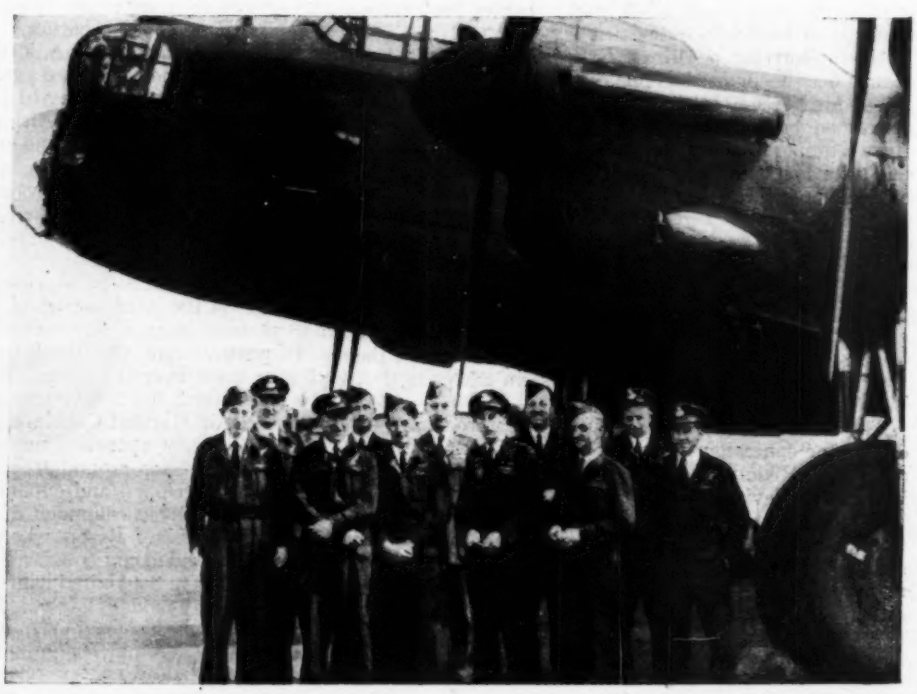
It may be so, but *The Times* Africa correspondent has sounded a word of warning against jumping too hastily to that conclusion. He has written that one of the chief technical problems involved in the operation was the effect of air bombing on ground batteries. Experts are now examining that effect, but the writer was doubtful whether many guns were actually put out of action. He attributes the speedy surrender of the island to the poor quality of the Italian garrison left there, and believes that Germans (or better Italians) would have put up a far stouter resistance. If there had been resistance, he holds that the British landing parties would have had a very tough job. He says that the operation proves very little, and that "the question whether air and sea bombardment alone can compel the surrender of a fortress remains unanswered."

The possibility must not be ruled out that the experts, after completing their investigations, may form quite a favourable opinion of the effects of air and sea bombardment, but at the moment it will be well not to jump to conclusions.

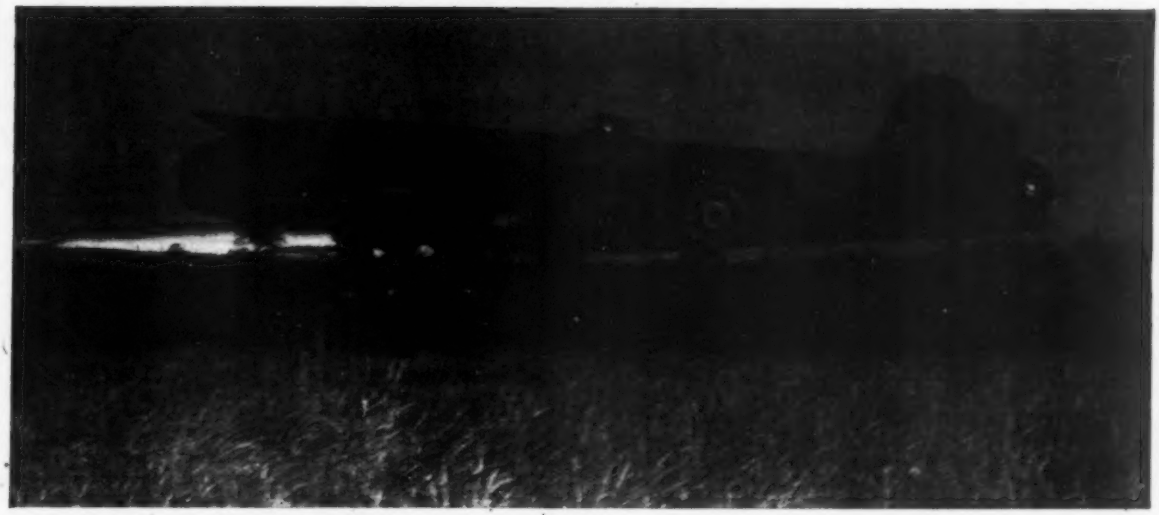
These problems of fire effect are not only interesting but of the greatest importance. They must have a great effect on the chances of the coming battles. In the meantime, however, it is very comforting to know that Pantellaria is safely in Allied hands.

CONTENTS

The Outlook	649
War in the Air	651
Here and There	654
Aircraft Characteristics	655
The Cheetah Engine	656
American Air Policy	658
Behind the Lines	660
The Middle East Theatre of War Operations	660, a & b
The Dive Bomber	661
Notes from a Test Pilot's Diary.—No. 10	666
Technical Training	667
Correspondence	669
Front Line Airline	670
Service Aviation	672



The Avro Lancasfer and its all-Australian "pathfinder" crew which flew from the United Kingdom to Australia via America and has now flown on from Melbourne to Wellington in New Zealand. This last part of the journey was completed in 7 hrs. 40 mins. The maximum fuel capacity of the Lancaster is officially given as more than 2,000 galls. and its extreme range as over 3,000 miles. Presumably for this journey to the other side of the globe extra fuel tanks were fitted in the bomb bay.



A Halifax 1A nearly airborne as it takes off into the gathering night for a raid on the Ruhr.

WAR in the AIR

The King in N.W. Africa : Italian Islands Captured : Great Air Fight Over the Solomons : Kiska Bombed

THE visit of His Majesty the King to the Allied troops in North West Africa came as a surprise to everybody outside a very small circle. To all the Empire troops there it brought delight and encouragement. The visit keeps up the tradition of the House of Windsor, for King George V paid frequent visits to the British troops in France during the last war. France, however, was but a short distance away from the shores of England, whereas the visit to Africa entailed a long flight through the night across waters where not long ago a civil aircraft was attacked and shot down by the enemy. It may also be mentioned that during the last war the German air power was but a fraction of what the *Luftwaffe* has since become, and that then the risk from a hostile raid was but small. A few weeks ago Tunisia might not have been thought the healthiest part of the world for the King of all the Britains. That would not necessarily have deterred King George VI, for he has gone through the German *blitz* on London and shared the dangers of the people of his Capital. Buckingham Palace was hit by bombs in daylight, and the King was often there by day. Being under fire is no new experience for His Majesty, who is a veteran of Jutland, and was "Commended" in despatches after the battle. Incidentally he is also a qualified R.A.F. pilot himself.

Those whose business it is to guard the King are probably more anxious about his safety than he is himself, and the fact that they raised no objection to what was undoubtedly an adventurous flight is evidence of the helplessness of the Axis air arm in the western Mediterranean. The islands of Pantellaria, Lampedusa, and the two small ones named Linosa and Lampione have all been occupied by the United Nations; and though Sicily is within range of Tunisia, there is now no chance of a huge force of bombers from there spreading over Tunisia and searching for the crowds which might give information of the presence of the King. In fact, the visit to Africa is a testimony of Allied air supremacy in that important quarter of the globe.

The capture of those islands was a very satisfactory piece of work, but

CAUGHT IN THE ACT: A remarkable photograph of a 40mm. cannon-armed Hurricane IID attacking armoured vehicles in N. Africa.

we should not be in a hurry to draw definite conclusions from the operations. The case of Pantellaria was not on all fours with the case of Crete. The subject is discussed in the leading columns of this issue. At any rate, it is very satisfactory that the Allies have now started to advance northwards from Africa, and further moves are anxiously expected. No doubt the long lines of ships which were spread out along the route round the coast to the Middle East are now congregating at some base in readiness for the next advance.

WAR IN THE AIR

The Bomber Offensive

MANY parts of Germany cannot have enjoyed their Whitsun holidays very much. Recent targets for heavy raids have included Dusseldorf, Münster, Bochum, Oberhausen, and Cologne. The wretched city of Cologne had its 115th raid on the night of Wednesday, June 16th. One is rather surprised that there is anything left in the place which could be worth bombing. But the German is an industrious and persistent beast—Cologne had been left pretty well alone since the end of February, and in the interval the enemy had been doing what patching up he could. The city is too important to him to be written off as crashed beyond repair, and our reconnaissance aircraft had brought in reports of the Germans' activities. They had been keeping an eye on the progress for some time, but it is the best policy to allow repairs to make a certain amount of progress in peace, and then, when there is something worth hitting, to go out and batter it. That wastes German effort and man-hours, and has a most discouraging effect on those engaged in the work of repair.

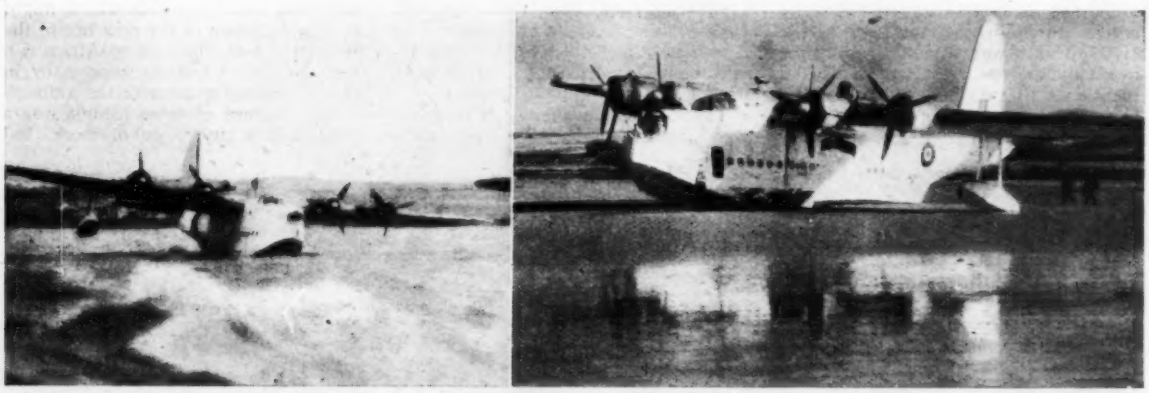
Out in the Atlantic it has been noticed that the crews of U-boats have adopted new tactics when attacked by our aircraft. They no longer seek safety by diving, but stay on the surface and try to drive the aircraft off with their guns. That goes to show that the depth charges dropped by the aircraft of Coastal Command have been proving effective, and that the U-boat commanders have found that evasion is not the best policy. A submarine which dives automatically puts itself out of action for a considerable time, and its speed below the surface is so low that the convoy may well have got out of its reach by the time it ventures up to the surface again. If it can wing the aircraft and drive it away, the U-boat remains in a position to attack—that is, provided that it is not within easy range of an escort vessel. The naval authorities responsible for the safety of the convoys regard this change of tactics by the U-boats as one more success to the Allied Nations in the Battle of the Atlantic.

Another sign of German frustration and irritation has been more frequent raiding by night over England by small forces of German aircraft, most of them fighter-bombers. On a good many nights lately one or two of the raiders have reached the London area and set the sirens wailing. Few, if any, have penetrated beyond the outer limits of Greater London, but some bombs have been dropped and some casualties caused. It is easy for the German broadcasts to tell the people at home that these were heavy raids which did an immense amount of damage, and were suitable reprisals for the heavy blows struck by the R.A.F. at German industrial centres. Actually, of course, they make no difference whatever to Britain's war effort, and only cause individual tragedies. The raiders, too, seldom escape scatheless, for the British defence system continues to grow stronger and more efficient as time goes on, and the number of German raiders destroyed, though not enough to cripple the *Luftwaffe* in Western Europe, make up a very respectable proportion of the machines which set out. It must be discouraging work for the German pilots, and if they were not very resolute men they would hardly persist as they have been doing.

In the Pacific

A TERRIFIC air battle took place over Guadalcanal on June 16th, when American airmen encountered an unusually strong force of Japanese machines and shot down 77 of them, 45 Zero fighters and 32 bombers, for the loss of only six of their own machines. The Japanese are said to be fatalistic fighters who regard death in action as the normal and natural end of a soldier, but even so, a result like that must have a discouraging effect on the survivors. After all, their great idea is to die in a victory, not in a defeat, and they must have realised by this time that their airmen are no match for the Americans in any way. The manufacturing resources of Japan are not unlimited, and the loss of 77 aircraft in one engagement can be no light matter.

Following on the American recapture of Attu Island in the Aleutians, the American Navy has started to tackle the larger island of Kiska, which lies farther to the East. Naval Venturas have raided the island and scored hits on the main camp area, the runway on the airfield, and the anti-aircraft battery positions. Further attacks from the air and the sea are



SUNDERLANDS IN GREAT GALE: During one of the worst gales experienced off the west coast of Scotland, air crews at a Coastal Command Station fought day and night for eleven days to save their Sunderlands from disaster. Members of one crew clambered out on to the wings of their aircraft to keep it balanced and remained there for over an hour during a fierce hail-storm. Another pilot stayed at the controls of his Sunderland for 50 hours. The only communication between the aircraft and the shore was by radio telephone, and to keep the radio working batteries had to be sent out regularly. They were towed out in parachute bags lashed to dinghies, and paid out by line to the aircraft. Supplies were sent in the same manner. Not one of the flying boats was lost. (Left) A Sunderland riding out the high seas. After the storm, a Sunderland beached on the sand. She sustained very little damage.

WAR IN THE AIR

ENEMY AIR LOSSES TO JUNE 19th

	Over G.B.	Continent	Middle East	N. Africa
June 6	1	0	10	9
" 7	0	0	0	11
" 8	0	0	0	1
" 9	0	0	3	18
" 10	0	4	1	39
" 11	1	5	0	14
" 12	5	2	1	0
" 13	4	3	5	0
" 14	0	2	1	4
" 15	0	4	0	16
" 16	0	2	1	5
" 17	0	9	2	2
" 18	0	0	1	39
" 19	1	4	1	1
	12	35	26	159

Totals: West, 7,018; Middle East, over 5,369; North Africa, 2,109.

to be expected. The Americans will not waste time.

Later reports from Guadalcanal give the Japanese losses in the great air battle as 94 instead of 77. Another interesting item of news from the Pacific is that Vultee Vengeance dive-bombers have been in action over an island named Selaru, in the group of Tenimber islands. Almost immediately after Dunkerque the Royal Air Force placed an order for Vengeance machines, and the time which passed without any deliveries being made caused much comment. Now the type has appeared in the Pacific. In the meantime the R.A.F. in Africa developed the use of fighter-bombers and "tank-busters" as a means of discomfiting the Axis forces, and the results were most gratifying.

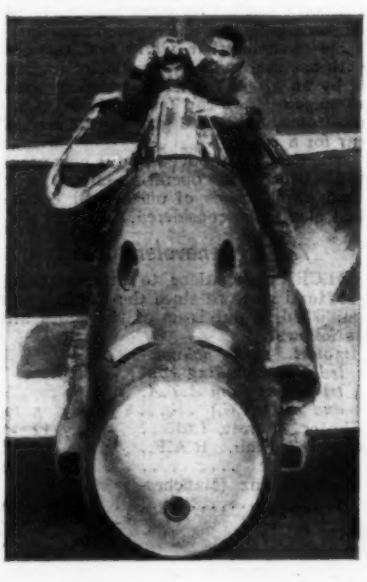
An East Asian Command

THE most significant piece of news published last week was that an East Asian Command was to be formed to conduct the war against Japan, relieving the Commander-in-Chief of India of that responsibility. This announcement accompanied the other announcements that Field-Marshal Wavell was to become Viceroy in October and that General Auchinleck would straightway resume his former appointment as Commander-in-Chief.

The first reflection aroused by these announcements is that the Armies of the Empire lose the services of two of our most brilliant military commanders—at least so far as command in the field goes. The name of the officer who is to be placed in charge of the new Command may be announced before these words are published, and at the moment of writing speculation would not be profitable. It will almost certainly be a combined Command, at least over the Army and Air Force, and perhaps over the Royal Navy as well, in the sphere of operations. It will, we presume, be analogous to the positions held by General Eisenhower in North-West Africa and General MacArthur in the South-West Pacific. It is a comforting thought that the Empire (or should we say the United Nations?) is now so rich in competent leaders that it can afford to deprive the fighting forces of two such men as Wavell and Auchinleck as conductors of campaigns.

In the Mediterranean there was a lull for some days, and then the air offensive against Italy and the Italian islands broke out more fiercely than before. Naples suffered heavily, and so did Syracuse. Perhaps Sardinia was subjected to the most widespread bombing, and it is evidently intended that that island shall be left in no position to interfere with future operations by the Allies in the Western Mediterranean. Corsica, a French possession now in the hands of the Axis, has not been similarly attacked at the moment of writing. Naturally, the Allies do not want to hurt French civilians.

Northern France, however, where the Germans are using factories to help their war effort, cannot be left alone. Last October a force of Lancasters made a daylight raid on the armament factory of Le Creusot, 170 miles south of Paris. The works cover about 270 acres, and are so important that the Germans set to work to repair them and get them into working order again. Last Saturday night a force of four-engined bombers went there again to destroy the repairs. Only slight opposition was encountered, and the bombers set about their task methodically. Their losses were very light, and it is hoped that great damage was done to the factory.



NOT ON HOT BRICKS: An American "Cat" in a 60-knot blizzard on Adak Island in the Aleutians.

BRITISH & U.S. AIR LOSSES to JUNE 19th

	Over G.B. A'crft.	Continent B'brs.	Continent F'trs.	Middle East A'crft.	N.W. Africa A'crft.
June 6	0	0	0	0	1
7	0	0	4	0	2
8	0	0	1	0	1
9	0	0	0	0	1
10	0	0	3	0	6
11	0	51	1	0	3
12	0	25	1	0	0
13	0	29	5	1	0
14	0	18	0	0	0
15	0	2	0	0	7
16	0	14	5	0	0
17	0	0	3	0	0
18	0	0	0	0	8
19	0	3	2	0	0
	0	142	25	1	29

Totals: West, 6,408; Middle East, about 2,096; North West Africa, 748.

JET PROPELLED FIGHTERS—NOT YET!

What appears to be a hoax surrounds this picture. Certain daily papers in reproducing it described the aircraft as a new-type "propellorless" Italian plane driven by compressed air. "The circular intake in the flat nose," it was explained, "admits air to the compressor and ejects through an adjustable outlet in the tail." We fear that someone has been hoodwinked! The nose is an ordinary spinner, the revolving airscrew blades have not reproduced and the aircraft appears to be Reggiani 2001 of orthodox type.

HERE AND THERE

Transatlantic Tow

BRITISH gliders are being towed over the Atlantic by four-engined Halifax bombers, according to a German News Agency.

New Air Mail Service

FOR the purpose of speeding-up important Government and Service correspondence, a temporary air mail service between Canada and Britain will be opened shortly.

Gas Turbines and Jet Propulsion

FOR some weeks the first edition of the above handbook by G. Geoffrey Smith has been out of print. A second edition with two extra chapters is now available from *Flight* offices, price 3s. 6d., plus postage 3d.

"British Plastics"

TO the range of technical journals published by the associated Iliffe Press the monthly periodical *British Plastics* has now been added.

It is the pioneer journal of the plastics industry and was founded in 1929 to encourage development in an industry which is now rapidly expanding.

Dearer Air Mail

THE Postmaster-General has announced that the air postage rate on correspondence for French and Spanish Morocco, Algeria and Tunisia has been increased to 1s. 3d. per ½oz. for letters and to 7d. for postcards.

The air postage rate on correspondence for Tangier has also been increased to 9d. per ½oz. in the case of letters, and to 5d. for postcards.

To Discuss Technical Training

THE importance of providing adequate training for students in aircraft engineering, which has been stressed from time to time in *Flight* and its associated journal, *Aircraft Production*, is reflected in the discussion to be held to-morrow night by the Royal Aeronautical Society, when the subject will be "The Education and Training of Aeronautical Engineers."

Dr. Roxbee Cox is to take the chair, and Sir Roy Feddon will open the discussion by giving a brief outline of the position as he found it in America. A number of others prominent in the aircraft industry have promised to attend the discussion, which, though of an informal nature, will try to cover every aspect of the subject, including research workers, those in the industry, the R.A.F., and civil air transport.

The meeting is being held in the lecture theatre of the Institute of Mechanical Engineers, Storey's Gate, S.W.1, and begins at 5.30 p.m.

Good Show, Canada!

CANADIANS represent about 25 per cent. of the men engaged in the bombing of Germany and Occupied Europe, according to Air Marshal H. Edwards, Air Officer Commanding Royal Canadian Air Force overseas, who has just returned from a trip to various parts of the Empire. He also said that about 25 per cent. of the personnel of the Royal Air Force were Canadians.

Mr. C. G. Power, Minister of National Defence for Air in Canada, has also given some figures of the air training scheme in that country. There are now 154 training schools under the British Commonwealth plan, and they have turned out more than 50,000 Allied airmen, as well as 75,000 personnel trained in ground trades.

Training aircraft numbered 10,000, and more would soon be available.

Clipped Spits

IT has now been officially disclosed by the Air Ministry that both the Spitfie V and the Spitfire IX are in service with clipped wings; hitherto only the clipped-wing version of the "Spit Five," some of which are in service with the R.A.F. in North Africa, had been mentioned.

Since the shorter span and square tips tend to increase induced drag as well as wing-loading, thus adversely affecting rate of climb and ceiling, it is a little surprising to find this wing-clipping treatment applied to the Spitfire IX, whose chief duties are performed at the higher altitudes.

On the other hand, detachable tips would mean that the "Nine" could either retain its maximum altitude performance or take advantage of the greater low-level speed and manœuvrability imparted by clipped wings, whichever happened to be the more desirable at the time.

New First-aid Kit for Aircrews

A NEW first-aid kit will soon be carried by R.A.F. crews. The pack, which is fireproof and waterproof, will contain an adaptation of the Stannard anti-burn glove for burns on the hands. The glove is made of oiled silk, which excludes the air and contains antiseptic and curative powders.

Bomber Crew Blood Donors

AFTER a recent Sunday night raid on an East Coast town bomber crews in the neighbourhood heard that some of the injured were in urgent need of blood transfusion. They at once volunteered to give their blood, and, after they had done so, went back to their station and that night flew to the Ruhr.

Big Increase in T.C.A. Traffic

PASSENGERS carried by Trans-Canada Airlines in April totalled 11,537, an increase of 2,722 over the corresponding period last year. Mail was more than doubled, rising from 139,379 pounds in 1942 to 292,401 this year. Express increased nearly four times, from 16,572 pounds to 61,577 pounds.

U.S. Post-war Aircraft Market

THE bulk of America's vast output by her aircraft industry will have to be absorbed after the war by purchasers of small aircraft for private, business, and personal use, or for small commercial operations, such as tuition, rental, and charter. This, at any rate, was the opinion recently expressed by Charles I. Stanton, their Administrator of Civil Aeronautics.

Transport aviation, he thought, would only be able to consume a small proportion of the industry's output, which, in 1942, had risen to nearly $6,250,000,000, or more than fifty times that of 1938. The 1943 production value was likely to be something like $20,000,000,000.

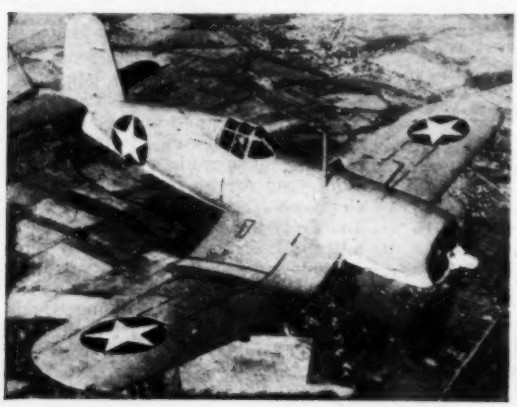
He thought that while few families with one car would be anxious to replace it by an aircraft, there were more than 1,000,000 "two-car families" in U.S., most of whom would give up the second car for a plane.

The part to be played by the now practical helicopter, operating from back yard or flat roofs of offices and hotels, had also to be considered.

A.T.A. Benevolent Fund

RECENT donations to this deserving fund received since the last list was published in our issue of May 20th are as follows:

Amount last acknowledged (excluding contributions from A.T.A. and B.O.A.C.)	£7,383	5	11
Gloster Aircraft, Ltd. ..	7	12	0
Officers' Club, R.A.F., Kirkbride	5	5	0
Bennett Linz (Manchester)	3	3	0
	£7,399	5	11



BY ANY OTHER NAME! Here is the Brewster-built Corsair fighter on its first test flight, to which we referred on this page on May 6th. Under the U.S. Navy system it is the F3A, the original Vought-Sikorski Corsair being the F4U-2. Now Goodyear Aircraft are also producing the same machine as the FG-1. Apparently the American aircraft firms are a trifle "touchy" about mentioning another concern's name, but it is of no account if plenty of Corsairs get built.

Fifty-fourth of the Latest Recognition Series

Aircraft Types and Their Characteristics

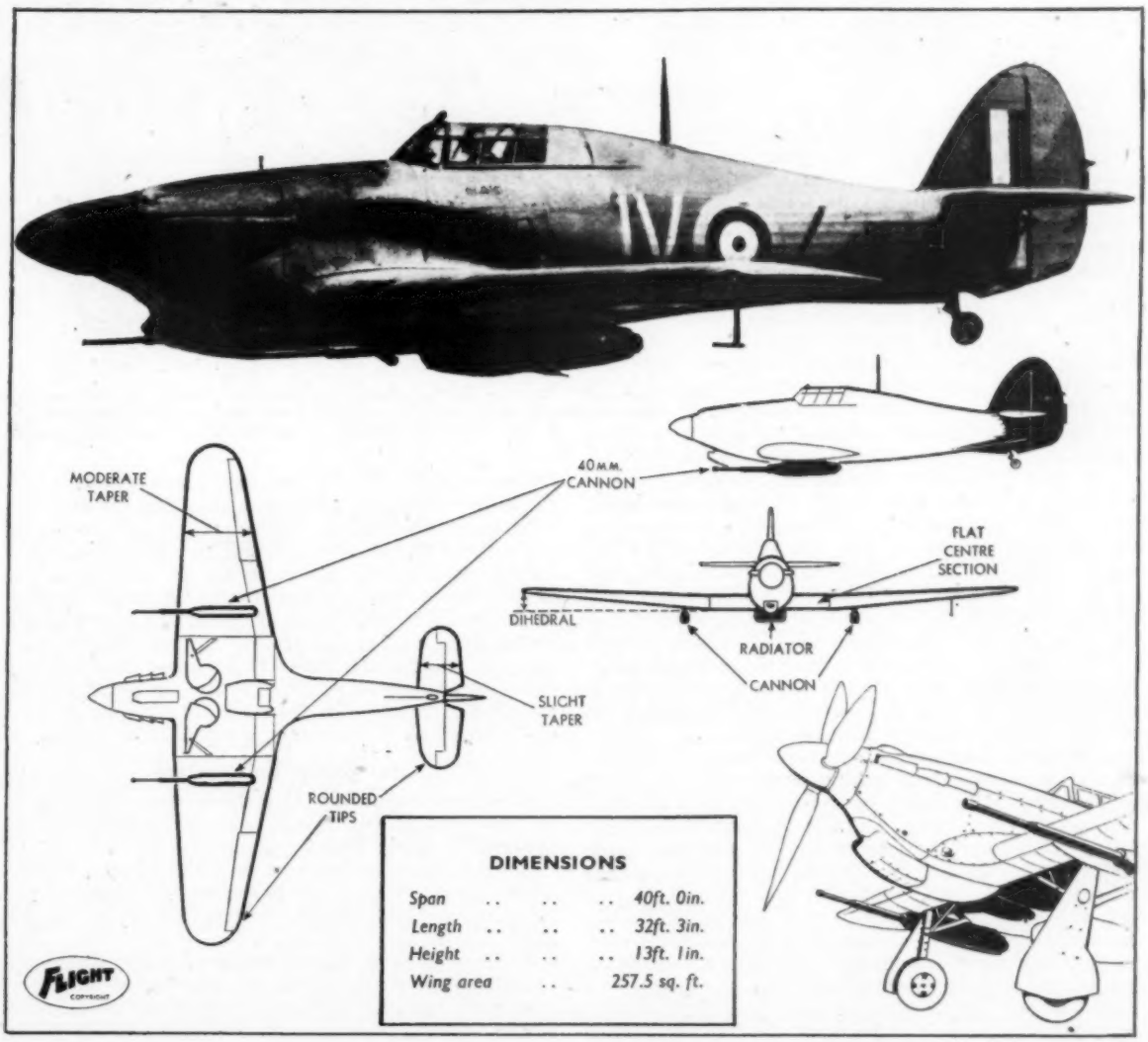
HAWKER HURRICANE IID

NO aircraft has proved more adaptable to meet the increasingly wide range of duties which the progress of the war has demanded than has the Hawker Hurricane.

The latest version of the Hurricane about which information may be given is the IID, commonly known as the tank-buster, or still more affectionately as the tin-opener. This came into being specially to deal with the Hun's crawling arsenals in the African campaign (the biggest example of which was the Mark VI tank), and mounted a pair of 40 mm. cannon, one under each wing. The result of that campaign makes it unnecessary to stress how efficiently Jerry's tins were opened.

Basically, the Hurricane IID is the same Hurricane that began its belligerent career as a simple eight-gun fighter, and has remained essentially the same through all its variations up to the present one. Possibly no better indication of its obliging nature could be given than its steady increase in all-up weight from less than 6,000 lb. to well over 8,200 lb. Actually, the weight of the tank-buster is rather less than the IIc with long-range tanks, but a little greater than the normal IIc.

Its 40 mm. cannon were designed specially for aircraft use, and at 640 lb. a pair of these weigh slightly more than four 20 mm. cannon. They are mounted in fairings beneath the wings, as shown below; and, since the IID was for service in Africa, the tropical air-cleaner was also fitted. Its top speed is in the region of 320 m.p.h. with the 1,280 h.p. Rolls-Royce Merlin XX engine, which is only a few m.p.h. slower than the IIc version.



DIMENSIONS

Span	*40ft. 0in.*
Length	*32ft. 3in.*
Height	*13ft. 1in.*
Wing area	*257.5 sq. ft.*

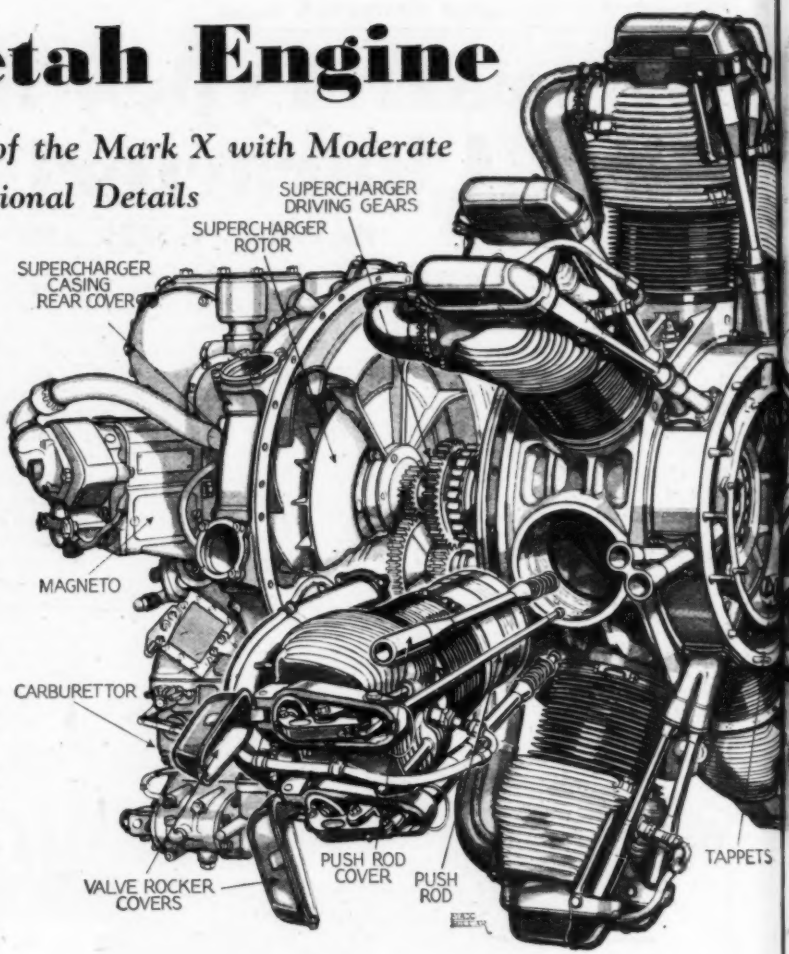
D

The Cheetah Engine

Improved Take-off Power of the Mark X with Moderate Supercharging : Constructional Details

UNQUESTIONABLY the best-known radial engine used on training aircraft of the R.A.F. is the Cheetah, built by Armstrong Siddeley Motors, Ltd. This seven-cylinder radial air-cooled engine has a bore and stroke of 133.3 mm. by 139.7 mm., giving a total capacity of 13.66 litres; the compression ratio is 6.35 to 1. Of simple and sturdy design from the outset, it has been developed over the years, the latest engine bearing the designation Cheetah X. This particular type is now approved with the Cheetah IX for a full-throttle take-off on 87 octane fuel. The maximum power developed at take-off is 420 b.h.p. and the maximum climb, level and cruising figures have been increased proportionately.

A remarkable fact about this engine is that the official overhaul period since November, 1941, has been 1,200 hours. Quite lately in Canada the Cheetah X has been approved at 1,400 hours between overhauls. Thousands of R.A.F. pilots have received their elementary training in the air aboard machines fitted with this engine, as it is largely used in connection with the Empire Training Scheme apart from other services. Arduous conditions are naturally imposed upon training aircraft, particularly when they are used, as in this case, under extreme variations of climatic conditions.



An "exploded" drawing of the Armstrong Siddeley Cheetah X which emphasises has been developed over the past 11 years from 260 h.p. to its present 420 h.p. seven cylinders of the 14-cylinder Panther whereas the

The latest forms of the Cheetah engine, as mentioned, are the Mark IX and Mark X, the latter being the modified version incorporating provision for the use of a variable-pitch airscrew. The nett dry weight of the engine is 694 lb. It is moderately supercharged at plus 2½ lb./sq. in. boost for take-off and for maximum climbing plus ½ lb./sq. in. In applying the supercharging apparatus the design has been kept simple by the use of a single gear train only to drive the rotor. Applied to the supercharger is the Claudel Hobson type AV 70 M updraught carburettor, and sundry other auxiliaries, including the twin magnetos, are also mounted at the rear. The oil pumps and pressure filters are mounted outside the crankcase nose, and in this position provide ready accessibility. The same observation may be made concerning the sump filter, which is located between two lower cylinders. The crankshaft is a one-piece steel forging of the single-throw type having a brass balance weight fitted to each crank web and revolves in two roller bearings. A thrust ball race is pressed into the front cover and further secured by the interference fit of the thrust plate. The master rod and the six auxiliary connecting rods are air-hardened steel stampings.

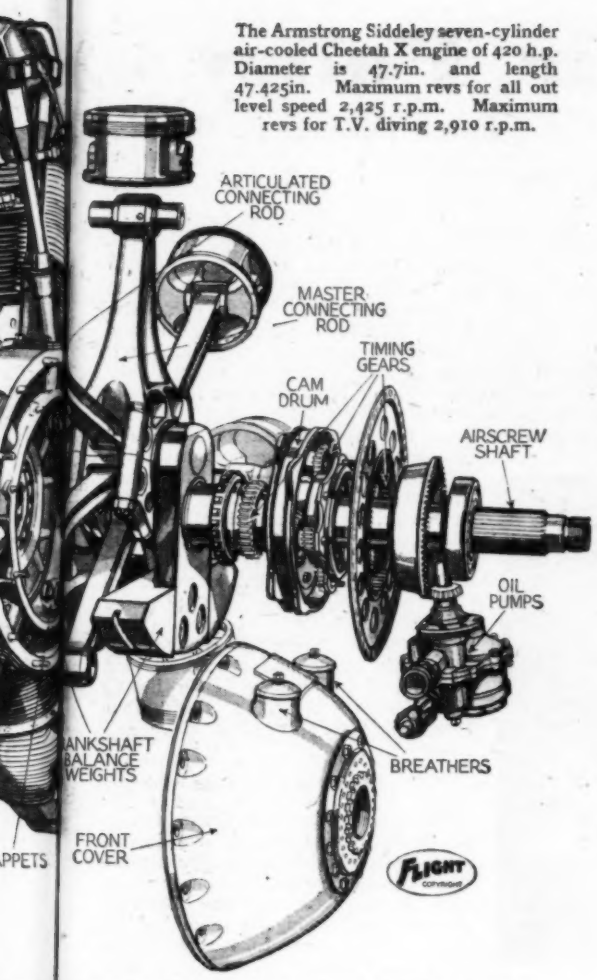
Aluminium alloy heads are used, and into them a steel barrel is screwed and shrunk, the two parts being further secured by a locking ring which acts as a fin. To assist cooling there is close-pitch finning on both the cylinder head and the barrels. There are two valves per cylinder operated by enclosed push-rods from roller tappets on the front extension of the crankcase, the exhaust valve being sodium cooled. A series of cams on the periphery of a drum driven at half engine speed by epicyclic gearing operate the tappets. Valve seatings are stellited. The valve rockers are completely enclosed, and have their ball-bearing fulcrum spindles mounted in forks which are integral with rods extending to bosses on the side of the cylinder head casting.

Dry Sump Lubrication

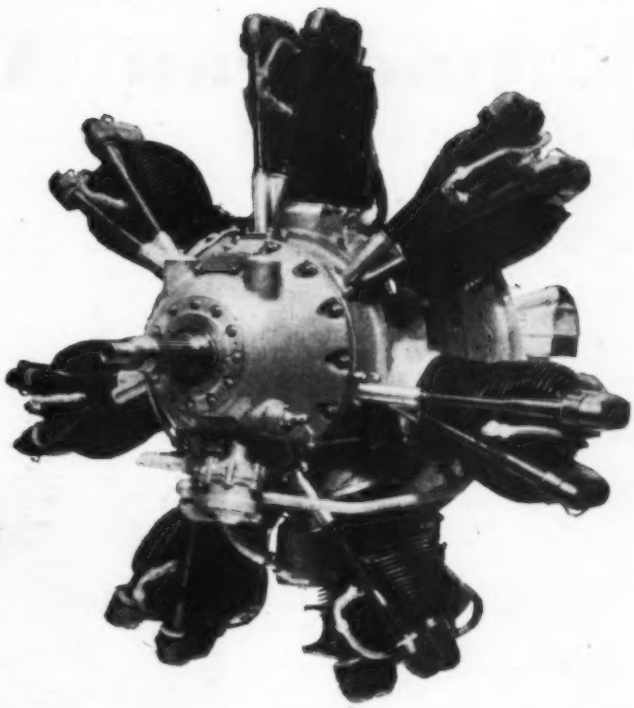
When the engine has attained normal temperature, the rods expand lengthwise to maintain a constant gap between the valve rocker and valve step.

The light-alloy pistons have four rings, one compression ring near the crown, two above the gudgeon-pin boss and a double scraper ring at the bottom of the skirt.

Lubrication is on the dry-sump principle, the pump unit being driven by a bevelled gear bolted on to the cam drum carrier. The unit incorporates two pressure pumps and a scavenge pump; the main pressure pump



The Armstrong Siddeley seven-cylinder air-cooled Cheetah X engine of 420 h.p. Diameter is 47.7in. and length 47.425in. Maximum revs for all out level speed 2,425 r.p.m. Maximum revs for T.V. diving 2,910 r.p.m.



phasise layout and sturdy build of this engine. The Cheetah h.p. In form it was known as the Lynx Major, since it was s the veloped from the Jaguar.

is for engine lubrication, and the auxiliary pressure pump is for operating the v.p. airscrew when this is fitted.

Starting is by Rotax electric motor or by the crank handle, either of which turn the crankshaft by means of a reduction gear and sleeve-engaging jaw. Damage through back-fire is prevented by a clutch. Breeze ignition harness is utilised. The engine is attached to the aircraft tubular framework by a large-diameter conical steel ring bolted to the rear face of the crankcase.

Under maximum continuous cruising conditions at 275 b.h.p. at 2,100 r.p.m. with minus ¼ lb./sq. in. boost, the consumption is 20.5 galls/hr. This is reduced under maximum economical cruising conditions at 230 b.p.h. at 2,100 r.p.m. to 14 galls/hr.

Four New Civil Aircraft

IT has now been disclosed that the four British firms who have been given the task of preparing designs for post-war civil aircraft—a "spare time" job to be done without hampering war production—are the Bristol Aeroplane Co., Handley Page, Ltd., A. V. Roe and Co., and Short Bros. and Saunders-Roe, Ltd., jointly.

This choice is the result of recommendations made to the Government by the civil aviation committee presided over by Lord Brabazon, and has no doubt been accelerated by the determined attitude of speakers in the House of Commons.

The necessary plans are being put in hand immediately and, should the resultant aircraft be ready in time, they will be invaluable for war transport, but their chief function will be that of ensuring that Britain has suitable types in readiness to reopen our Empire and other air routes after the war.

One other civil type is already in production, namely, the Avro York, which might be described as a Lancaster with an entirely new "civilian" fuselage. One of these will be a specially equipped aircraft for the use of the Prime Minister on his long-distance journeys, and is now being completed. Other Yorks will go into service as war transports.

Of the four new types now to be designed, three are landplanes and one, for which Shorts and Saunders-Roe are responsible, is to be a giant flying-boat.

The projected flying-boat, it has been revealed by Sir Alliott Verdon Roe, will be far bigger and be of more advanced design than any aircraft yet built in this country and will be capable of carrying up to 200 passengers on comparatively short journeys. A range of 4,000 miles based on a fuel load of 23 tons has also been mentioned. Details of the three landplanes may not yet be disclosed, but it can be assumed that they will be of comparable size and performance.

Major Jack's Back

HIS many friends in the British aircraft industry will be glad to hear that Maj. Jack Stewart has now fully recovered from his illness. Not only so, but he is back in the industry again, or will be on Monday next. On June 28th he starts with W. S. Shackleton, Ltd., of 175, Piccadilly, where one of his first tasks will be to "liaise" between the different Ministries and firms which have no London office and are located some distance away.

There should be a useful job of work to be done in that way, more especially so since Maj. Stewart has had experience of the industry as well as of the Ministries. Before the war he was joint managing director with Maj. Mayo, of the Mayo Composite Aircraft Co., Ltd. He then joined the Air Ministry as one of the Assistant Directors of Aircraft Production, subsequently to become a Deputy-Director at the Ministry of Aircraft Production. From the latter position he had to resign owing to ill-health.

"Jack" Stewart's connection with the aircraft industry dates back to the period after the war 1914-18, when he joined the Aircraft Disposal Co., Ltd. His activities included Cirrus Aero Engines, Ltd., and Boulton and Paul, Ltd. He will be heartily welcomed back in the industry, and he and Mr. Shackleton should make a good team. Both believe that "aviation is the coming thing."

American Air Policy

Belief in Daylight Bombing : A Tactical Air Force Formed in Britain

By MAJOR F. A. de V. ROBERTSON, V.D.

SOME time ago it was announced that the crews of Fortress aircraft belonging to the U.S. Army Eighth Air Force in the British Isles were to practise night flying. This naturally led to a general belief that the Americans had decided to take to night bombing of targets in Germany, in which they would share in the campaign of the Royal Air Force Bomber Command. This, however, is not the case. It is true that the American crews are practising night flying, but their object in doing so is not any change of policy. This special training is merely intended to increase the flexibility of the American bomber force. Obviously, aircrews which have only been trained to fly by day must have their abilities and activities somewhat circumscribed. For instance, cases may occur, and very probably will occur, in which it is desired to bomb a certain target at dusk. Then, when the job is done, the crews must find their way back to their bases by night and land in the dark. All of this requires practice. Bomber Command gained a lot of invaluable experience during the period of leaflet raids in the early months of the war, and it stood them in good stead in 1940 when squadrons setting off for Germany received the welcome order: "Bombs on." The American crews are gaining their experience of night work in the periods between active operations.

Brig. Gen. Eaker, commanding general of the United States Army Eighth Air Force in the European theatre of operations.

Confirmed by Experience

The Eighth Air Force, now commanded by Major-General I. E. Eaker, sticks to its belief in day bombing, and, in fact, believes in it more firmly than ever as the result of its experience since it arrived in the United Kingdom. The doctrine is that day bombing is more accurate and, therefore, more efficient. That it is, or can be, more accurate has never been denied by the Royal Air Force. An authoritative spokesman of the R.A.F. recently admitted that because of the greater precision obtained by day a smaller number of bombs could do more damage than a larger number dropped by night. The American bombers, notably the Fortress, were designed for day bombing. Their special bomb-sight makes for great accuracy, and this largely discounts the somewhat lighter bomb load which they carry, as compared with, say, the Lancaster. Of course, pin-point targets cannot be hit unless they are visible, and it is sometimes pointed out that the Fortress was designed to work in the clear atmosphere of the Pacific Ocean and the Caribbean Sea, and that the murkier air which so often prevails over Europe must detract from the advantages conferred by the special bomb-sight. However, the Eighth Air Force is well satisfied with the results of its operations to date over Western Europe.

The Fortress was designed for working at very high altitudes. High flying naturally makes for safety by increasing the difficulties of the A.A. gunners. It may be taken as a maxim in the everlasting struggle between attack and defence that aircraft will never be able to fly so high as to be beyond the possible range of shell-fire; but range is one thing and scoring a bullseye is another. Fighters, it goes without saying, can fly as high as any bomber can do (if designed for that purpose) but the heavy armament of the Fortress, with its thirteen machine guns (twelve of them of 0.5 calibre), makes it a veritable hedgehog to the enemy fighter. A formation of Fortresses multiplies the defensive power of each machine. In addition, the human being is less alert, less efficient when at a great height, and this fact must be a greater handicap to fighter pilots who have to initiate an attack than to gunners in the bombers whose job is, so to speak, cut and dried. In actual fact, the losses of American aircraft in the ten months they have been working from Britain have been less than 4 per cent. of the sorties made.

The Eighth Air Force has found that a force of about 100 bombers can be guaranteed to saturate and obliterate a normal industrial target. The Force does not work on the principle of area bombing, but selects a special target and pin-points it. A formation of 100 machines can deal conclusively with a target of fairly small dimensions. In the case of larger targets successive waves of 100-bomber formations can be sent, sufficiently timed and spaced so that the limited fuel supply of the hostile fighter force will prevent the fighters from striking at all of them with maximum effect.

Sparing Civilians

This policy of bombing limited targets by daylight has another very important result. It keeps down to a minimum the damage inflicted on civilians. Only people living near the objectives or actually working in them for the enemy have much to fear from the American bombs. The pity of it is that, even in Germany, many of the workers are people from the occupied territories who have been forced against their will into doing slave labour for their inhuman conquerors. That is one of the many tragedies of this war. We may compare the plight of these unfortunates with that of the British seamen who were prisoners in the German battleship *Von Spee*. Even if Admiral Harwood had known for certain (what he may well have suspected) that there were British prisoners in the German ship, he could certainly not have stopped his cruisers from continuing to fire at her. The American airmen have the greatest sympathy for the poor people in the occupied territories, and warnings have repeatedly been sent to them (in particular to the French folk in the submarine bases of the Brest peninsula) that certain targets were due for attack. This was done despite the certainty that the defences would be strengthened and that the danger to the American aircrews would thereby be increased. The British authorities have likewise advised the civilians in such places to move inland. Such actions show that chivalry in war is not entirely a thing of the past.

Many places in Germany have not yet been bombed and probably never will be bombed, and the life of the ordinary German citizen (taking the whole of the country into account) is not endangered by the Allied bombing offensive. Nevertheless, there are manifest signs that the attacks on the Ruhr and the German ports are causing disquiet in the country. That is not to say that German *moral* is breaking or that the civil population will try to put pressure on its rulers to force them to sue for peace. Of such an outcome there is as yet no indication at all—nor is it likely

AMERICAN AIR POLICY

that if it took place it would make much impression upon the Nazi leaders. Only military defeat by land is likely to have any effect of that sort. But propaganda has been started with the object of persuading the Allies and some neutrals that bombing is useless as well as inhuman. The Americans are as firmly convinced as are the British authorities that it would be gross folly to be misled by this propaganda campaign. The enemy cannot be allowed to purchase immunity from attack by moving factories into occupied territory—and it is occupied territory with which the American bombers have as yet been mainly concerned. When the resources of the Eighth Air Force have been sufficiently increased the intention is that its bombers shall penetrate farther and farther into Germany. Up to the present its activities have been limited by the supply of aircraft and aircrews.

Brave Words

The very wise policy has been adopted of not incurring losses at a greater rate than replacements can be made. It is held by the Americans that a force which fights ten major air battles a month with the same crews and machines has done an outstanding job, and Gen. Eaker doubts if any Air Force at the present time could keep up such a rate of attack. But the effort is growing. Since March last the strength of the Eighth Air Force has been more than doubled, and the present strength will itself be doubled again by next October. Prudent though the policy adopted undoubtedly is, it is not absolute. If some critical situation should arise, such as a landing on the Continent, then, to quote the brave words of Gen. Eaker, "we will throw in all we have, hour after hour and day after day, if necessary, until it is used up, to support an overall successful land, sea and air battle." Men of that spirit make the best of partners and allies.

Accepting the American firm adherence to day bombing, it is interesting to study their attitude to the general policy of the bomber offensive. Gen. Eaker obviously has an open, though one may guess an optimistic, mind on the subject. He has stated: "I make no predictions about the end of the war, but I am much interested in the effect bombing is going to have." That is surely a much saner attitude than the reckless way in which some enthusiasts on both sides of the Atlantic have committed themselves to the theory that bombing alone would win the war if only all our efforts were to be concentrated on it alone, to the exclusion of everything else—even, it would seem, to the exclusion of the air contribution towards the Battle of the Atlantic. The British Air Staff has never expressed such views, though it is probably not unfair to say that it seems keener on the bomber offensive than on any other of its activities—perhaps because in that it is not helping or being helped by any other Service. Bombing is its very own child.

Gen. Eaker holds that, so far, the R.A.F. and the Americans have been engaged in the early phases of trying out what bombing can effect, and that before this year is out the two nations will have an adequate force in the United Kingdom to make the experiment in thorough fashion. It will be remembered that Mr. Churchill recently said something to the effect that the bomber offensive was worth trying out. The fact is that there is no precedent to guide us in forming an opinion.

Tactical Air Forces

It was a surprise, and a gratifying surprise, to learn that the U.S. Army Eighth Air Force had been divided into a force for strategic bombing and a Tactical Force. Naturally, the doings of the various Air Forces in the African campaigns have been studied carefully by the staff of the Eighth Air Force as well as by the R.A.F. Air Staff. The Americans had their own observers in Africa, and the conclusion drawn was that no major change in the methods of the Eighth Air Force was called for, either in equipment or in tactical doctrine. This conclusion seems to have applied chiefly to bombing methods. The main lesson learnt from North-west Africa was the success of the Tactical Air Force there. Gen. Spaatz, it will be remembered, divided his force into three—Strategical, Tactical and Coastal. The first was commanded by Gen. Doolittle, the winner of the Schneider contest in 1925 and the gallant leader of the bombers which raided Tokyo and other places in Nippon. The Tactical Air Force was under Air Marshal Sir Arthur Coningham, who had accompanied Gen. Montgomery all the way from El Alamein to Tunisia, leading the Western Desert Air Force. The task of that force was to provide air co-operation with the ground troops, and so well had it fulfilled its task that its A.O.C. was obviously the right man to take command of the Tactical Air Force which had been formed by Gen. Spaatz in Tunisia. British, American and French squadrons were combined in it, and the equipment of those squadrons was not limited to one or two classes of aircraft. Every class which could be of use to the armies was included, and the success of the experiment was outstanding.

In the earliest campaigns of the present war observers were amazed at the success of what was then the new German technique in combining the powers of tanks and aircraft to overcome opposition on land. Now those German methods appear crude to us. But the British were slow to adapt their own methods to what was evidently the master way of the future. The less said about the air side of the campaign in France and the Low Countries the better—except that the pilots were as gallant as everyone knew that they would be, and that the Hurricane proved itself a masterful fighter. It is true that at first there were in France two bodies which might be called rudimentary attempts at a Strategical and a Tactical Air Force, namely, the Advanced Air Striking Force and the Air Component of the Army Expeditionary Force. But the distinction was not preserved. The Air Ministry (doubtless with the concurrence of other authorities) did not develop each separately, as is now recognised to be the correct procedure, but combined the two into one. The excuse may be that the supply of aircraft was then so poor that whatever the Air Ministry attempted could hardly have been a success. Still, the move in the wrong direction should be noted.

With ampler resources the correct use of the air weapon was evolved in Africa. There, too, there were trials and errors at first, and lessons had to be learnt from mistakes. Fortunately, they were learnt in time. When the final clash occurred in Tunisia, the Tactical Air Force gave a display of the right way to help an Army which can, without exaggeration, be described as perfect.

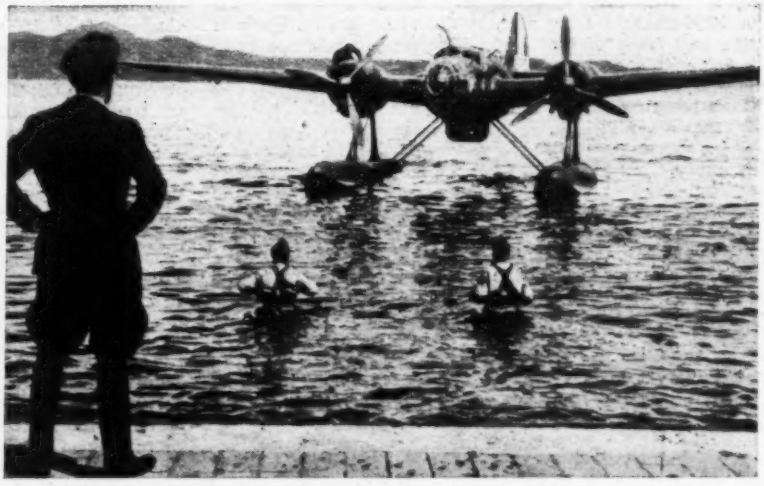
Anglo-American Amalgamation?

It is true that after the evacuation from Dunkerque the R.A.F. formed the Army Co-operation Command. So little has been published about that body that one is in no position to commend or to criticise it. Judging by results, it may be presumed that, after three and a half years of *sub rosa* existence, it was judged to be so far short of the best possible that it has now been absorbed in a new R.A.F. Metropolitan Tactical Air Force. Both the American Eighth Air Force and the R.A.F. are thus developing along the same lines.

One may speculate as to whether the next step will be the amalgamation of the two Tactical Air Forces in this country. In North-West Africa the British and Americans were combined and interleaved with the happiest results. In the United Kingdom one can see and understand the determination of the American bomber force to remain separate from the R.A.F. Bomber Command. They are divided by a difference of doctrine, the one believing in day bombing, and the other being mainly committed to night operations. So far as is known, there is no such doctrinal difference between their respective Tactical Forces. Both authorities have based their conclusions on the lessons taught in North Africa, where the two nationalities worked as one. There seems no reason why they should not do the same here.

Behind the Lines

Service and Industrial News from the Inside of Axis and Enemy-occupied Countries



THE FIAT R.S.14 SEAPLANE. Powered with two Piaggio P.XI RC.40 engines of 1,000 h.p. for take-off it has a maximum speed of 220 m.p.h. at 13,120ft.

Gliding

THE Rumanian Under-Secretary for Air announced on the 18th inst. that gliding schools are accepting candidates from 16 to 24 years of age for free training. Board and lodgings are also provided at the expense of the Government, which hopes in this way to build up cadres for its depleted air force.

A.A. Gun

ACCORDING to a German report, the A.A. units of the *Luftwaffe* in the West and on the Eastern front have been supplied with a new multiple machine-gun. This gun is said to be a quick-firing type, suitable for defence against high-flying aircraft and employing 40-mm. projectiles.

Jap Labour—

THE Japanese Minister, Suzuki, stated in a Press conference that since the war 3,000,000 additional workers have been employed in the Japanese war industry.

—and Gliding

IT is officially stated from Tokyo that gliding and the manufacture of gliders are becoming increasingly popular with Japanese university, college and secondary school students. Since the war the construction of sailplanes and gliders has become a compulsory subject in the curriculum of some technical schools. According to a report by the Japanese Ministry of Education, 1,151 schools are encouraging their students to practise gliding, and a total of 1,444 gliders are owned by them. At the outbreak of war gliding construction was limited to 602 schools, owning a combined fleet of 700 gliders.

Production

AT a meeting at the Berlin *Sportpalast* Dr. Goebbels and Armament Minister Speer gave some information on the German home front. According to Goebbels 3,500,000 additional workers have been absorbed in the industry.

Among the details given by Speer there was the significant statement that "The German armament industry is, to a large extent, safe from air attacks because its establishments are widely scattered; the shifting of the industry goes on all the time." He further asserted that the damage done to the two dams is of a temporary character and "has not interrupted production for *a single moment*."

Attempting to show the progress of the armament industry, Speer adopted the system of percentage increases, which is, to say the least, an ambiguous method. Thus the average monthly production of railway engines is said to have increased by 300 per cent. on the 1941 output, the production of heavy *flak* guns by 315 per cent. since 1941, and the monthly output of machine guns by 70 per cent. It is significant, however, that, when referring to the *Luftwaffe*, Speer refrained from using even the percentage values.

He merely stated that "since figures in this field can give the enemy advance indications of the important change-over in the industry it can only be said that this branch of war production, under the personal leadership of Goering, has introduced in the past year many new types which are already in production, and the number of aircraft produced in May represents by several times an increase over the average output in 1941."

From Vichy France

THE Vichy Secretariat-General for Air Defence announces that all Air Force N.C.O.s who were demobilised after the armistice and are now free and willing to join air defence units should report at their local administrative centres.

Explanation

GERMAN official propaganda is now trying to cash in on the dispersal of the industry. The locational distribution of the industry, which is known to have been going on for some time, is now boosted up in an attempt to show Germany's immunity from air attacks. Here is a typical example from a German propaganda broadcast: "The German armament industry does not possess a single colossal plant for production of both weapons and ammunition; therefore, the vulnerability of Germany's armament industry to enemy air raids is very slight.

"In cases where large plants are imperative for speedy and economical production, they have been erected in areas which the enemy air force cannot reach or even discover. Many former industrial plants recently bombed by Anglo-American airmen were nothing but empty buildings from which machinery had been removed to other localities a year or two ago. Every factory *still* working in the so-called exposed areas of Western Europe has been duplicated many times over in other parts of Europe. No matter how many bombs may fall on any part of Germany, the rhythm of production continues at even greater speed and efficiency."

Talking About Nerves

THAT the German man-in-the-street is increasingly getting nervous about possible future war developments, is evident from an article in a German daily. "When will things start moving in the east; will they ever start there; and if not, where? What are our U-boats doing just now? When shall we hit England in the air?" is said to be asked by every Schultz and Moeller.

"Waiting is not easy for some of us," says the writer, and adds: "This is comprehensible after four years of war which have left their traces, to which the series of blows we had to suffer last winter in the east and recently in Africa and at the present moment by the intensified air warfare should be added. Waiting is a bitter trial in the bombed districts."

Guerillas

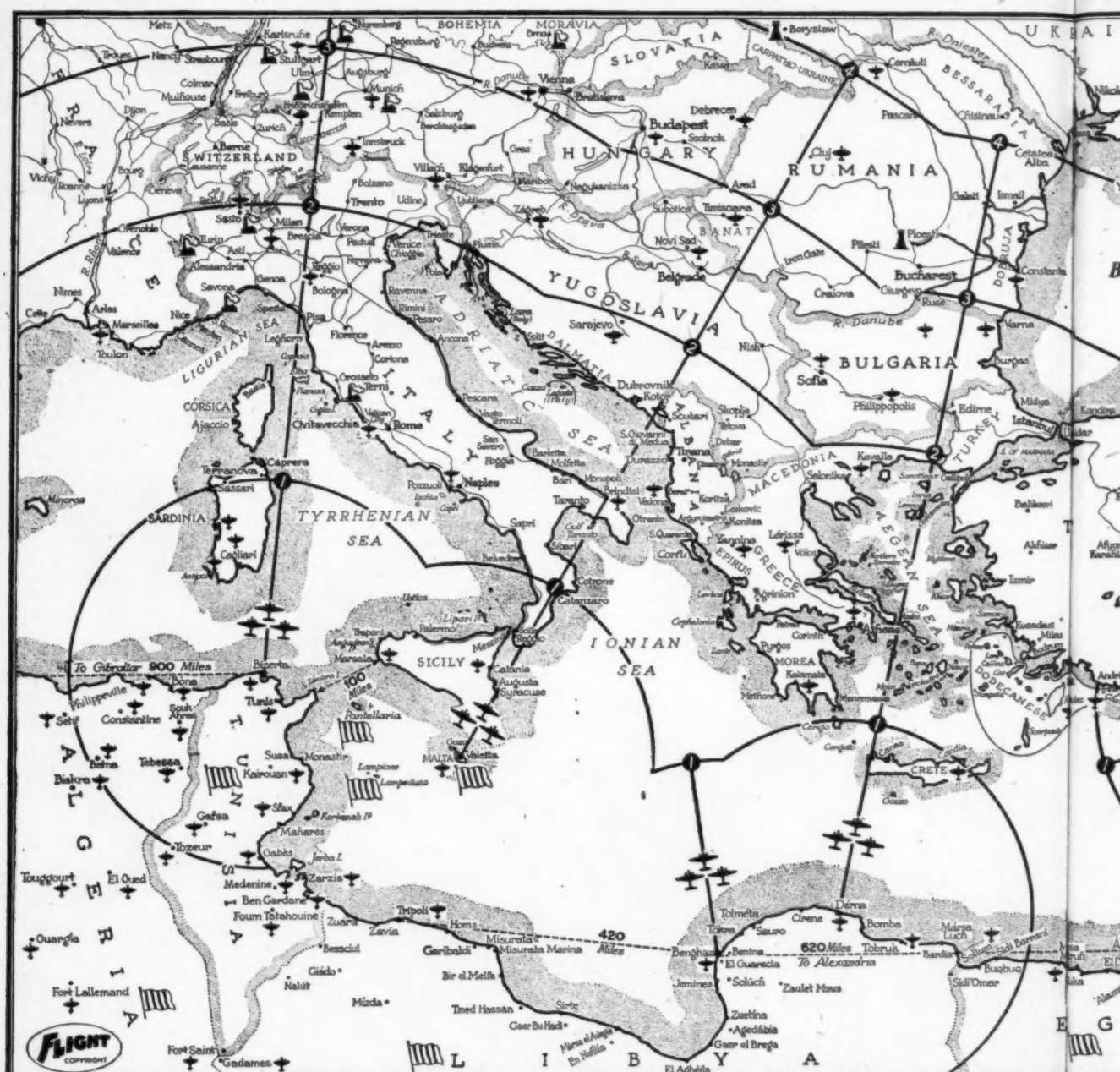
ACCORDING to information from neutral sources a detachment of Polish partisans has set on fire a large sawmill at Rzesna, which provides timber for the German aircraft industry. Another unit ignited an oil well and oil stores at Ustrzyki Dolne. In Lublin, where the aircraft works previously controlled by the Polish Government are situated, Polish guerillas damaged the electrical works which provide the current for the local airfield. Work had to be interrupted for three days.

Another guerilla unit, the "Mickiewicz Group," fought a German punitive expedition in that area. The Germans had to use aircraft, three of which were destroyed and one damaged.

ROLLS-ROYCE

"Merlin" FOR SPEED AND RELIABILITY

THE MIDDLE EAST THEATR


BOHEMIA
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SWITZERLAND
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ADRIATIC SEA
LIGURIAN SEA
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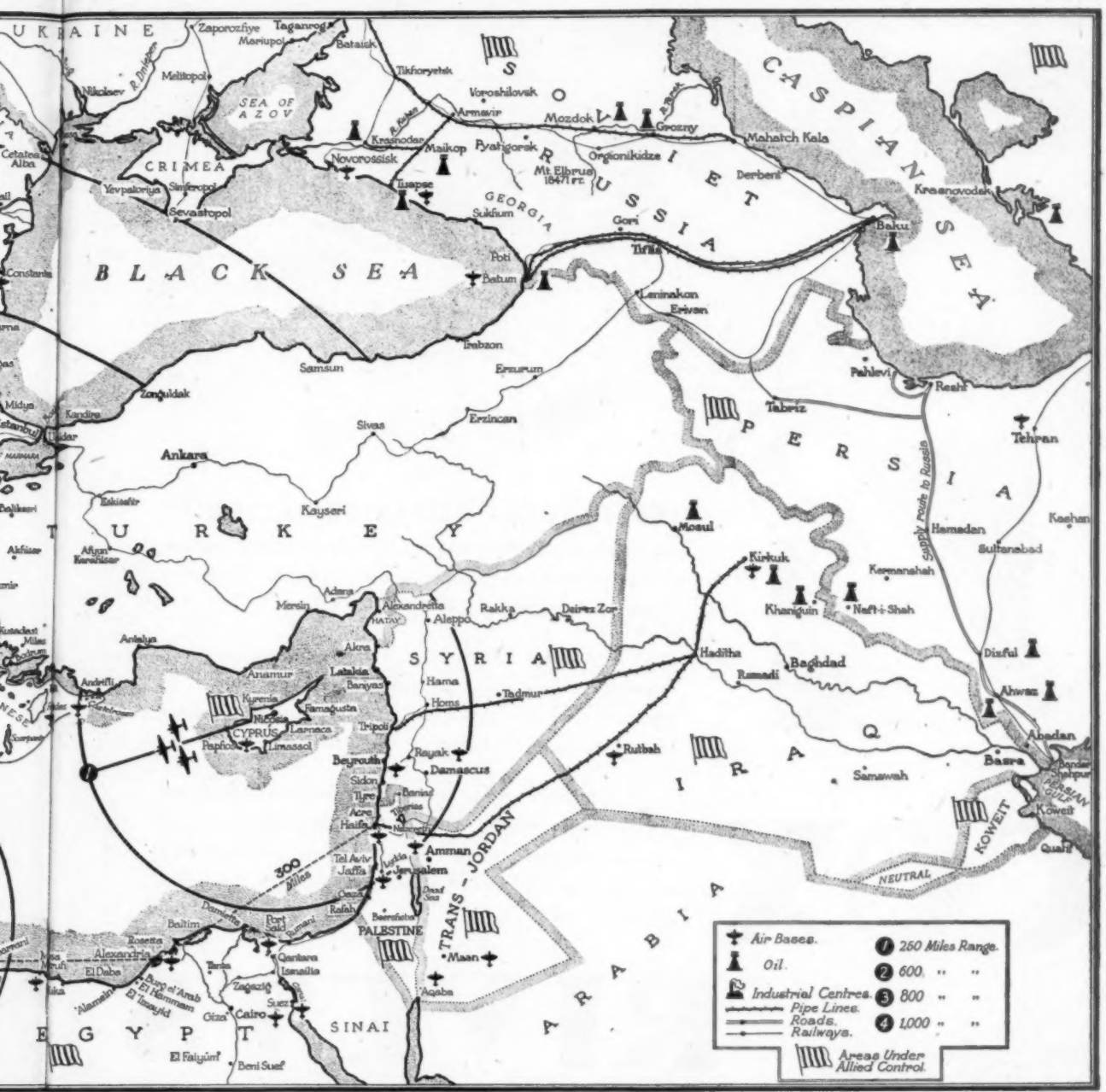
ATRE OF WAR OPERATIONS



tion of supplies to our bases in that theatre of war. The air offensive against other Axis strong points from where enemy aircraft and submarines can endanger Allied shipping will further reduce the hazards of the convoys.

Another supply route essential to maintain the offensive strength of the Allies is shown on the map; this is the Trans-Persian rail and motor road by which war materials are pouring into Russia.

Some examples of the typical operational ranges from Allied bases are indicated on the map showing the Eastern arm of the vast air power pincers which are closing in on Hitler's "Fortress of Europe": the narrow mainland of Italy with hardly any possibilities of industrial dispersal, the occupied countries of the Balkans, Rumania and Bulgaria, and some important sectors of Germany itself lie under the criss-cross of aircraft ranges from North African bases. It will be seen from the map that together these ranges for long-range fighters, medium and long-distance bombers do not leave one important part of Italy uncovered.

The Middle East is thus not only the bridge between British, American and Russian forces, but also one vast base for future operations. Coupled with the development of supply and communication routes and the existence of a wide range of air bases, Allied air power has here unique possibilities for striking at the enemy's most exposed bastions.

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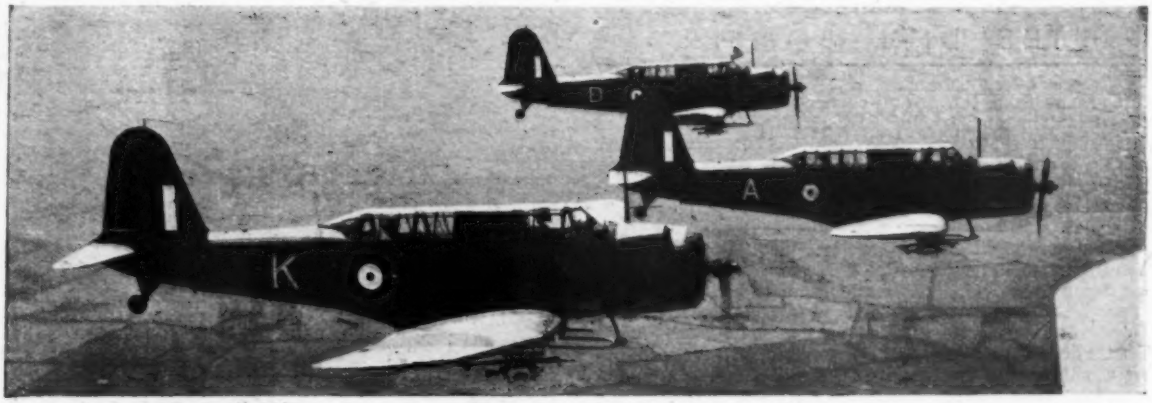


ANGLO-AMERICAN : A formation of Vought SB2U-3 dive bombers. These are known as Chesapeakes in the Fleet Air Arm.

The Dive Bomber

Development and Pioneer Work in U.S.A. : British Day Bombers Stressed for Diving : Italian and French Types

By "HELLDIVER"

(*Concluded from page 633, June 17th.*)

U.S.A.

The pioneer work of the U.S. Navy in formulating the design of dive bombers and in evolving tactics for their employment stands as the most notable contribution to dive bomber development prior to the ensuing period of intensive research in Germany.

It has been said that dive bombing in America was first suggested as an extension to the principle of fixed gunnery, i.e., that it is easier to aim a manœvrable aircraft than to "point" a free gun. This is probably true, for the first dive bombers to be tried out by the U.S. Navy were adaptations of fighter biplanes of the period—Curtisses and Boeings of 1926 vintage adapted to carry small bombs under their wings.

Thanks largely to the high factors to which U.S. fighters were—and still are—designed these experimental aircraft gave promising results. It is significant, in view of the foregoing remarks, that the first U.S. Navy aircraft designed specifically for dive bombing was, nevertheless, officially classed as a fighter; this was the original Curtiss "Helldiver" (U.S. Navy designation XF8C-2).

It is satisfactory that the name "Helldiver" was in common usage in the U.S.A. long before "Stuka" appeared in German tactical manuals, and it is not surprising that the Curtiss concern has retained the name to designate subsequent types of dive bombers which differ vastly in design from their forerunner.

The first "Helldiver" was made famous by the film "Hell Divers," in which dive-bombing tactics against warships were demonstrated. It was a compact, two-seater, single-bay biplane with a very pronounced sweep-back on the top wing. The engine was a direct-drive Wasp and the armament two front guns (the standard fighter armament of the period) and a free gun in the rear cockpit. A single bomb of up to 500 lb. was carried beneath the fuselage on displacement gear which took the form of two hinged arms engaging with lugs on the bombs. Dive-brakes were not necessary due to the low aerodynamic efficiency of the airframe.

The basic design was progressively developed, and by 1933 a two-row engine had been adopted and other refinements of the period incorporated. By that time "Helldivers" were also used by the Marine Corps.

The following three years saw the complete redesign of the "Helldiver," the official designation of which then became XSBC-3. The new model had a notably cleaner wing structure (there being only one interplane strut on each side of the fuselage); double-split trailing-edge flaps to provide an aerodynamic braking effect in the dive; a retractable undercarriage which could be raised, Grumman fashion, into the sides of the fuselage; a Twin Wasp Junior two-row radial, and a constant-speed Hamilton airscrew, the latter being a most important advance as the diving r.p.m., which had previously tended to rise to undesirably high figures, could be controlled.

Split Trailing-edge Brakes

It is of interest to note that the fitting of dive-brakes was a direct result of refinement in aerodynamic design, though bomb stowage was still external. In the double-split form of dive-brake employed, the trailing-edge of the wing inboard of the ailerons was split fanwise, the two halves opening like the leaves of a book. For landing, only the bottom "leaf" was operated, to give a normal split-flap effect, but for diving both sections could be extended to present the maximum braking area to the airstream.

As the SBC-3, the "Helldiver" was operated for about

The Curtiss SBC-4 or Cleveland of 1939 vintage. It carried a 1,000 lb. bomb slung externally.

THE DIVE BOMBER

three years from U.S. Navy carriers, but was eventually superseded in 1939 by the SBC-4, which was of similar design but was fitted with a Wright Cyclone engine. The SBC-4 has been supplied to the R.A.F. under the name "Cleveland"; it is of short span (34ft.) and carries a disposable load of about 1,700 lb., the all-up weight being 6,250 lb. The maximum speed has been quoted as 245 m.p.h., and the projectile load as one 500 lb. or one 1,000 lb. bomb carried externally under the fuselage on displacement arms, but wing racks are provided for two 100 lb. bombs. As an alternative to the fuselage bomb an auxiliary fuel tank may be carried.

In fairness to other American manufacturers and designers it must be recorded that early dive-bomber development in America was not entirely in the hands of the Curtiss organisation. Martin, with the encouragement and assistance of the U.S. Navy, produced a biplane capable of handling a 1,000-lb. bomb and of pulling out of a terminal-velocity dive with this still in place beneath the fuselage. This was about ten years ago when such an achievement was far more creditable than it is to-day.

The Great Lakes and Vought concerns also built dive bombers of good performance and great structural strength. The Vought SB2U-3, in particular, has been supplied not only to the U.S. Navy but to the R.A.F., in which service it is known as the Chesapeake. The published bomb load of this aircraft is one 1,000 lb., two or three 500 lb., or eight 116 lb. bombs.

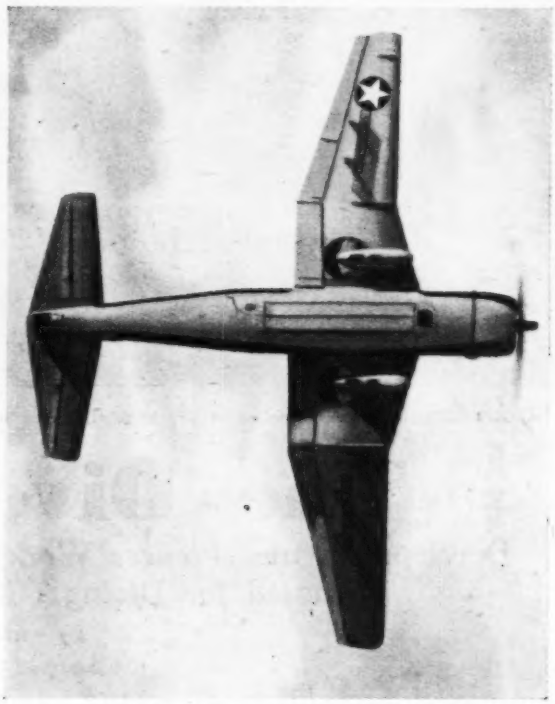
The Modern Helldiver

Latest manifestation of American dive-bomber development is the Curtiss SB2C-1 two-seated monoplane built for the U.S. Navy. This makes a particularly interesting comparison with the earlier biplane types, as it is a comparatively heavy cantilever-wing machine weighing about 11,000 lb. and having the high wing-loading (considering that it has been designed for operation from aircraft carriers) of 26 lb./sq. ft

Trailing-edge dive-brakes and leading-edge slots are fitted, and there is a retractable undercarriage and internal bomb stowage. The armament is much heavier than that of preceding Curtiss dive-bomber designs (a published American drawing shows four front guns) and the wing panels are arranged to fold upward for carrier stowage. The engine is a Cyclone 14 two-row radial developing 1,700 h.p. for take-off; much of this output is available when evasive action is taken after the bombing dive.

Details of the performance of the SB2C-1 have not been released but it is evident that this will be high. The U.S. Navy has ventured to authorise the statement that the aircraft is "100 m.p.h. faster than current types."

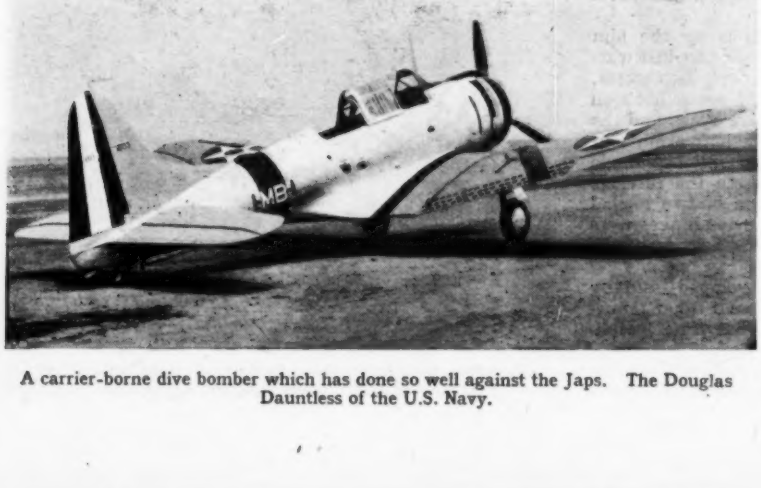
Fortunately more information is available on the structure of this up-to-date dive bomber. Considering the weight of the aircraft and its function, this must be of exceptional sturdiness. The wing is of remarkably low aspect ratio and is stated to comprise shear beams, ribs and stringers of aluminium alloy, covered with a smooth, flush-riveted Alclad skin. The deep monocoque fuselage is likewise flush riveted.



In plan view the Vultee Vengeance is similar to the Ju 87. The "grille" dive brakes are a feature of this machine.

Despite the refinements of structure and equipment the SB2C-1 was designed for rapid production and will be produced in a new 29-acre factory in America and at a Canadian works.

Apparently built to the same specification as the SB2C-1, the U.S. Navy's Brewster SB2A-1 (popularly known in the U.S.A. as the Buccaneer), is another brilliant example of modern dive-bomber design. The type resembles superficially the the Brewster XSBA-1 of 1936-7, which was one of the most advanced dive-bomber prototypes of its day; it weighed 6,000 lb. and was reported to have a speed of 285 m.p.h. This was among the first dive bombers to be fitted with perforated double-split flaps *cum* dive-brakes, the perforations having been found desirable for the reduction of tail buffeting, a phenomenon which had presented some difficulty with the "solid" pattern. The perforations, of necessity, incurred a slight reduction in braking efficiency.



A carrier-borne dive bomber which has done so well against the Japs. The Douglas Dauntless of the U.S. Navy.

The R.A.F. Burmudas will be operated from shore bases, but the U.S. Buccaneers are reported to be fitted with arrester gear for use on carriers. In layout the type is similar to the Curtiss monoplane already described, but is more nearly a mid-wing monoplane. It is stated that a 1,000-lb. bomb can be stowed internally and that trailing-edge, split-flap dive-brakes are fitted.

A power-driven dorsal turret, armour plate and leakproof tanks were

provided for in the original design (critics of the Ju 87 will do well to note this) and the engine is of the same type as that installed in the SB2C-1. The pilot, as in the Curtiss, is placed well forward in the fuselage to give him a good view over the nose for aiming in the dive.

Performance figures have not been released, but it is quite obvious that the maximum speeds of the Curtiss and Brewster must be at least 260 m.p.h., and that their layout and carrying capacity will permit them to be used for reconnaissance. The symbols "SB" in their designations do, in fact, denote that they are officially classed by the U.S. Navy as "scout-bombers." Moreover, although no mention has yet been made of the fact, it is equally evident that a dive bomber of this class should not have great difficulty in shooting down current types of Japanese shore-based and carrier-borne bombers and torpedo-bombers.

SB2C-1 in the U.S. Navy, A-25 in the U.S. Army, the modern Curtiss Helldiver is America's latest contribution to dive bombing.

The Curtiss and Brewster just described represent a very great technical advance over the Ju 87, and it is to be hoped that their appearance in quantity will not be unduly delayed. Fortunately, at least one other type of modern American dive bomber designed for the powerful Cyclone 14 engine is also in production. This is the Vultee Vengeance (U.S. Army designation A-31, or Georgia), the production of which has been entrusted to Vultee and Northrop.

In respect of its bizarre appearance, but certainly not in performance, the Vengeance follows the Ju 87 tradition. It is a low-mid-wing monoplane type, and is characterised by a pronounced sweep-back on the leading-edge of the centre-section of the wing and a slight sweep-forward on the leading-edges of the outer panels.

Dive-brakes, of different pattern from those on the Curtiss and Brewster, are fitted to top and bottom surfaces of the wing, and the main bomb load is carried (presumably on displacement gear) in the bottom of the fuselage. Smaller bombs can be slung externally beneath the wing. Mainplane and tail surfaces are of angular form and the whole aircraft should be suitable for rapid production. The span is 48ft., but no other details are available.

Whereas the SB2C-1, Bermuda and Vengeance are only now appearing in service, the U.S. Navy's Douglas SBD (Dauntless) series and their U.S. Army counterpart, the A-24, are available in larger quantities. These types, which compose the backbone of America's dive-bomber force, are not so modern as the models mentioned, but have proved themselves to be of sound design and to have a performance at least equal to that of the Ju 87.

Navy Foresight

It was the foresight of the U.S. Navy (which originally sponsored the development of the SBD series) that enabled the U.S. Army—when the potentialities of the Ju 87 had at last been made apparent to those responsible for its equipment—to take into service a proven dive bomber. It was only necessary to change the equipment, fit a deck arrester hook, and modify the tail wheel of the current SBD type.

The fact that the U.S. Army's first specialised dive bomber bears an "A" designation is not without interest. This indicates that it is officially classified as an "attack" (low-flying, ground-strafing) aircraft. Earlier "attack" types used by the Army had been quite unsuitable for steep dive bombing.

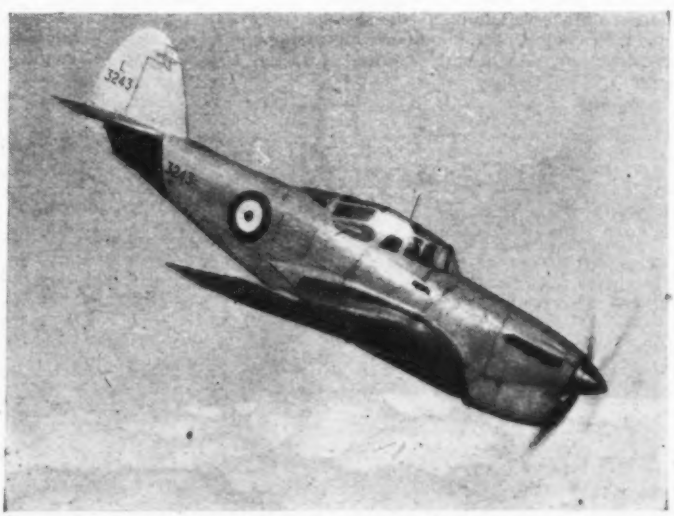
The Dauntless, or SDB, class of dive bomber has already distinguished itself in action against the Japanese. In general this is a development of an earlier Northrop design (the Northrop concern is now controlled by Douglas), and is a fairly conventional low-wing monoplane. Split, perforated, dive-brake flaps are fitted on the trailing-edge and the engine is a single-row Cyclone. The armament has been given as two 0.5in. fixed guns for the pilot and two free dorsal guns. A 500 lb., or possibly a heavier bomb, is carried externally under the fuselage, and there is provision for smaller bombs under the wing.

Up to the present no statement has been made on future U.S. dive-bomber policy. It may be that, following Germany's example, larger multi-engined types will be introduced. In any case, in view of her long experience, and considering her present commitments, America is unlikely to lag in the development of her single-engine dive bombers.

GREAT BRITAIN

Such information on British dive bombers as has been made available by the Admiralty and Air Ministry has already been published in *Flight*, and no useful purpose will be served in the present article by a recapitulation of technical details. A brief review of Great Britain's contribution to dive-bomber development is, however, necessary to give due credit to British designers.

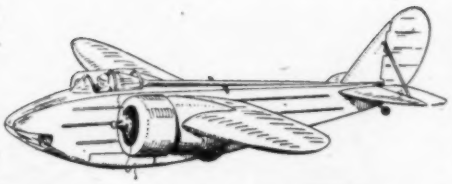
As already mentioned, experiments were made during the last war with bomb-carrying single-seaters. About



The Hawker Henley was stressed for dive bombing but was relegated to target towing for no apparent reason.

THE DIVE BOMBER

twelve years later interest revived, and Hawker Hart squadrons were trained as dive-bomber units. The Hart was eventually replaced by the Hind, which carried the same bomb load (500 lb.), but had a better performance. Army co-operation units equipped with "Hart derivatives" or Lysanders also practised dive bombing, as did the Nimrods and Ospreys of the Fleet Air Arm. Vildebeests, Swordfish, Sharks and other heavy multi-purpose biplanes likewise practised the diving attack, but the first specialised dive bomber to be introduced into service was the Blackburn Skua monoplane, which had such refinements as a monoplane wing, dive-brakes and internal bomb storage.



Variable-camber flaps were a feature of the twin-engined Savoia Marchetti 85.

The Skua was used exclusively by the Fleet Air Arm; no equivalent type was adopted by the R.A.F., although the Fairey Battle was shown on various occasions to be capable of making steep diving attacks. Unfortunately, the Battle was not equipped with dive-brakes; nor was the excellent Hawker Henley—a lighter and faster machine vastly superior in aerodynamic design to the Ju 87.

At present a number of modern dive-bomber types are being introduced into the R.A.F. and F.A.A., including the Vengeance, Bermuda, Helldiver and Barracuda. The excellent technical features of the American types were dealt with under "U.S.A."

ITALY

Although a large amount of individual research work has been done in Italy in connection with dive-bombing aircraft (*picciatelli*), the standard Italian machine in this class is at present the Ju 87 assembled in Italy. This is identical with the German model already described (sub-types B and R), and special comment is not called for. Italian bombs of 250 kg. and 50 kg. are used.

In considering original Italian dive-bomber design, it is essential to differentiate between these aircraft and the specialised low-flying attack (*assalto*) types. The latter are not equipped for steep diving attacks, although it is believed that at least one type, the Ba 65, has been fitted with dive-brakes for experimental work.

The first specially designed Italian dive bomber to achieve (or, perhaps, more accurately, to be allowed) public notice was the Savoia-Marchetti SM 85, a twin-engined, single-seater, shoulder-wing monoplane of wooden construction. As already pointed out, the twin-engined arrangement allows exceptionally good visibility from the pilot's cockpit. The fuselage of the SM 85 was of rectangular section, and to achieve the strength demanded it was found necessary to fit external longitudinal stiffeners.

Other features worthy of particular note in the design of the SM 85 were the type of dive-brake used (a trailing-edge, variable-camber flap which could be deflected through 90 deg. for diving, and through a small arc for take-off and landing), and the internal stowage of the bomb load in the belly of the fuselage. The armament was one 12.7 mm. forward-firing fixed gun.

Although the SM 85 was never used in large numbers, a convincing demonstration of its powers was given before the war at a display in Italy. A development of the SM 85, the SM 86, is of cleaner design and is fitted with two Isotta-Fraschini Gamma or Delta 12-cylinder inverted air-cooled engines.

Since the beginning of the war the existence has become known of a new type of Italian dive bomber, possibly designated Ba 201. This is a comparatively small Breda-designed single-seater low-wing monoplane with an inverted gull wing which has square tips and incorporates double-split dive-brakes between the ailerons and fuselage. The engine appears to be a DB 601.

A single bomb, probably of 500 kg., can be carried internally, or semi-internally, in a ventral compartment. Ejector arms, apparently arranged in tandem, ensure that the bomb clears the airscrew arc. Armament appears to consist of two fixed front guns, possibly of 12.7 mm. calibre.

Recently photographs have been published of Réggiane Re 2001 fighters carrying a single bomb beneath the fuselage. No dive-brakes have yet been identified, but it is possible that the Re 2001, which is known to have a strong structure, might be adapted for dive bombing.

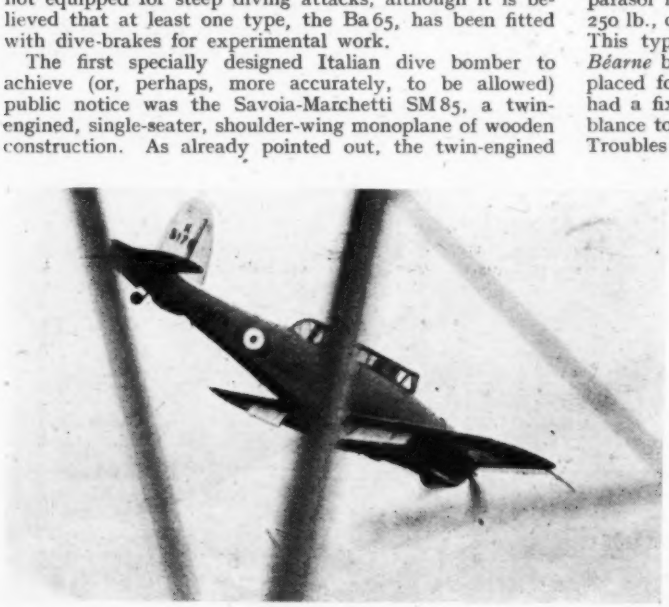
FRANCE

Probably the earliest French dive bomber was a converted single-seater fighter—a Naval Gourdou-Leseurre parasol monoplane with a single bomb of no more than 250 lb., carried on displacement gear beneath the fuselage. This type was intended for operation from the carrier *Béarne* but was of inferior performance, and an order was placed for an inverted gull-winged Loire-Nieuport. This had a fixed undercarriage and bore a very strong resemblance to the original Spitfire, though it was a two-seater. Troubles were experienced with the structure, and the type was redesigned as a single-seater with a retractable undercarriage.

Although a small production order was placed for Loire-Nieuports, the best dive bomber in service at the time of the fall of France was a Vought-Sikorsky similar in design to the R.A.F. Chesapeake.

Certain types of reconnaissance aircraft, including float-planes, were used by the French for what was termed *bombardement en semi piqué* (shallow dive bombing).

In recent years several patents have been taken out by French designers on ingenious dive-bombing devices, notably dive brakes, and development is doubtless continuing under German surveillance.



A Blackburn Skua going into a dive. The dive brakes are down at 90 degrees to the wing.

HOLLAND

Although development of the design has not continued during the German occupation of Holland, mention must be made of the twin-engined Fokker G.1, a special version of which was one of the most advanced of pre-war dive bombers. This resembled the Lightning in lay-

THE DIVE BOMBER

out and was fitted with Ju 87 type dive brakes, the effectiveness of which was demonstrated on a number of occasions.

JAPAN

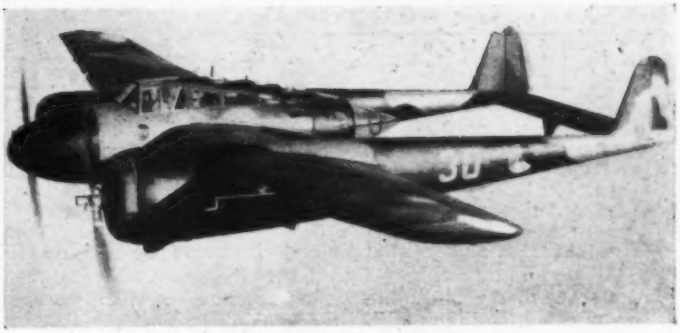
The standard naval dive bomber used by Japan is the Aichi Type 99 deck-landing monoplane, which is comparable in performance, load carrying capacity, and even in appearance, with the U.S. counterpart, the Douglas Dauntless.

It cannot truthfully be said, however, that the Aichi is a "copy" of the American machine, for its dive brakes are similar to those on the Ju 87 and were doubtless the outcome of visits by German technicians to Japan.

The existence of twin-engined deck-landing dive bombers of Japanese design has been reported, but these do not appear to have been employed operationally.

The Japanese army has been slower than the navy to adopt specialised dive-bombing aircraft, choosing to rely on light bombers without dive brakes (in the class of the Fairey Battle) for diving attacks. Doubtless specially equipped machines with brakes and other modern devices will be introduced before long, particularly as the Naval Aichis have achieved a fair degree of success.

Nevertheless, it may confidently be said that Japan is unlikely to produce anything remarkable in the way of dive-bombing aircraft, nor are "suicide" attacks likely to become prevalent, if, indeed, they have yet been been used at all.



The pre-war Fokker G.1 which foreshadowed the twin-engined fighter-bomber-destroyer type.

The Dash to Jena

Famous Mosquito Raid Described by the Officer Who Led it

THEN Mosquito IV aircraft of No. 139 (Jamaica) Squadron, R.A.F., under the command of Wing Cdr. H. W. Reynolds, D.S.O., D.F.C., carried out their now celebrated raid on the Carl Zeiss optical instrument works at Jena on May 27th, it was the deepest penetration thus far attempted by low-flying bombers in daylight.

Here is a personal description of the raid as told in a letter to Maj. de Havilland by Wing Cdr. Reynolds, who afterwards received a bar to his D.S.O.:—

"I was leading in 'B' for 'Beer' No. D.Z.601, a particularly fine Mossie, and I was airborne with the rest of the formation at a certain hour in the early evening.

"The North Sea was crossed at wave-top height and, on approaching the enemy coast, always the most tense moment, speed was increased and the formation closed up for the quick dash across. Once over, the trip becomes more interesting. One sees such things as cyclists jump off their cycles to have a look round to see what is coming, children look up at us, then put their heads down and run as hard as they can. Mechanical vehicles are almost non-existent—everyone cycles. Startled horses, sheep and cows scatter in every direction.

"There were no further incidents until we ran over one of Germany's reservoirs, when the Hun pushed up some accurate flak at us; fortunately, no one was hit, but shortly afterwards two of the formation collided and crashed. It was another 50 miles or so farther on when bad weather was encountered. First thick industrial haze, and then heavy low clouds covering the tops of the hills over which we had to fly. Of course, we had to enter cloud and climb high enough to clear the hills with a margin of safety. As soon as we estimated that we should have cleared the high hills we descended into the gloom beneath the clouds. To enable the other chaps to pick me up again—a very difficult job under the existing weather conditions—I put on my navigation lights for a short while. This was also done by the leader of the second section, Sqn. Ldr. Blessing. Crews afterwards stated that this was a great help for them to regain formation.

"At this stage we had arrived at a point approximately 20 miles from the target and we turned on to our run up, increasing speed and then openning bomb doors. We picked up various landmarks which we were looking for and knew from these that we were dead on track. The visibility was now down to about 1,500 yards—not much when one is travelling at such high speed.

"The target was now only two miles away but not yet in sight. At a thousand yards I picked up the tall chimneys and opened up to full throttle. My observer pointed out the balloons and immediately the flak came up at us in bright red streams and unhealthily close. Now it was every man for himself; I picked out a tall building and went for it, releasing my bombs at point-blank range. I yanked the stick back to climb over the building, and as I topped it the airscrew received a direct hit. There was a violent explosion in front of my eyes and I felt something tug at my hand and leg, but took no notice for the time being—things were too hot! Now we were in a veritable hail of tracer shells, dodging and twisting for dear life. More balloons ahead, which we missed by the grace of God, and now, apart from a few inaccurate bursts, we were clear and I was able to survey the damage.

"My left hand was bleeding freely, as was my left leg. The kite was vibrating considerably, and I could see holes in the fairing immediately in front of the radiator. Flak had pierced a hole just aft of the port radiator and close to one of the main tanks. There were two large holes in the fuselage close to the throttle box where some fitting had been blown away. My inter-com. had packed up and I discovered later that a splinter had severed the lead just below my starboard ear. The collar of my battledress was torn also; this wasn't noticed until I arrived back at base, when Flt. Lt. Sismore, my navigator, asked me what I had gone to get that!

"However, to continue; after that one violent explosion it seemed a miracle that the aircraft could keep in the air. I was especially anxious about my port radiator with that hole so near, and constantly checked the temps. to watch for any rise. Fortunately it remained constant at 98 deg. C., and the vibration got no worse, so the need to feather the damaged propeller never arose.

"We were now returning individually, and so I nipped into the low cloud for safety—to clear hills and avoid any flak that may have been put up My observer bound up my hand and then we settled down to the long journey home with frequent apprehensive glances at the engine instruments and fuel. I, personally, felt satisfied that I got the target with my bombs, and later one of the boys said he saw them go in followed by a sheet of flame a hundred feet high—and it would be some time before they actually exploded.

"On the way back we ran into more trouble by entering two more defended areas. The second one was very hot, and it was with luck that we escaped by means of violent evasive action combined with full throttle and fine pitch. Even though "B—Beer" was badly damaged, she behaved magnificently throughout and is now being repaired, which will take a few days. One of the port engine bearers had a large hole through the middle of it, but the vital parts of the engine were sound."

Notes from a Test Pilot's Diary.—No 10

Weather

When to Fly : Difference Between Prototype and Production Testing

By "WITNESS"

WEATHER always has been and always will be a special problem in flying. Where testing is concerned, the difficulties are all accentuated, the risks increased, and the possibility of obtaining accurate results reduced when flights are made in bad weather.

Before the war we could afford to be quite fussy about what kind of weather we flew in, but the greater importance of quantity production under wartime conditions has made us readjust our views to the situation. On the whole, we have achieved a considerable measure of success, and have managed to obtain satisfactory results when flying in much worse weather than we should formerly have believed practicable.

There are three respects in which the weather interests us primarily from the point of view of testing; that is, apart from the general safety requirements of flight, such as visibility and cloud height. These are whether the weather will allow us to reach Max. Power Altitude for carrying out a full-throttle, level-speed check; whether, having reached that height, conditions will be sufficiently calm and cloud-free to obtain a reasonably accurate set of figures; and, finally, whether there will be the minimum safe ceiling for a dive to the limiting speed of the aircraft. These are the main requirements for production flying. Sometimes further local restrictions may result from single-runway airfields, with wind of gale force blowing at right angles, or from an ordinary grass-covered airfield being unserviceable through heavy rain.

Few aspects of the job call for more experience than to decide, when the weather is border-line, whether any useful purpose can be served by flying or not. Who has not some painful recollection of having tried to fly when it really would have been wiser to have stayed on the ground, a recollection sometimes accompanied by a fleeting glimpse of mother earth revealed at uncomfortably close quarters on breaking cloud?

Trees at 2,000 ft.

There was the pilot who went up to do levels above 10/10ths cloud in the days when the Kollsman type of altimeter, with a large hand for hundreds of feet and a small one for thousands, had just been introduced. Having finished his job, he began to nose his way down through heavy nimbus cloud, diving quite fast, until, on approaching what he took to be the 2,000ft. mark, he began to level off. About the same time his attention was suddenly distracted by the blurred form of fir-trees which appeared unaccountably in the cloud. Almost before he could realise what was happening, he had mowed down a number of saplings at 300 m.p.h., but somehow his airscrew escaped serious damage, and he was able to pull up into the cloud again, despite the loss of much wing fabric.

The explanation was that the altimeter had been misread, the indication of 200ft. being taken for 2,000ft. Fortunately, despite such damage to the machine, the pilot eventually succeeded in making a safe landing.

I was recently reading a very interesting paper on "Flight Testing for Performance and Stability" by the late Eddy Allen, chief test pilot of the Boeing Company. To those who are not acquainted with the personalities of the American aircraft industry it might be explained that Eddy Allen was the George Bulman of the U.S.A. His remarks, therefore, can be quoted as the most up-to-date knowledge available.

Eddy Allen's Advice

On the subject of weather, Allen writes that if satisfactory performance tests at altitude are to be made, the following rules should be observed:—

1. Do not fly near or among clouds.
2. Determine the lapse rate over the test area either prior to the test or during the test by plotting temperature *versus* altitude in a climb. Do not conduct tests where the lapse rate is changing or near changes in slope.
3. Prior to running level speed performance runs, check the test area for adverse wind gradients by holding constant the altitude, r.p.m., and b.h.p., and noting any changes in airspeed.

These rules were, of course, devised essentially for prototype testing, and no one would question their soundness. On the other hand, we in this country are not blessed with such favourable climatic conditions as they are in America, and might well be forced to wait a month for such good weather, whilst only a few days were necessary over there. If we stuck rigidly to Allen's rules the time taken to complete prototype performance tests might render the machine obsolete by the time it was cleared! So we have to compromise and sacrifice extreme accuracy by flying in weather which is not absolutely ideal. Even now weather delays are extremely irritating, and sometimes even serious.

Although these notes are devoted principally to the problems of production test flying, the conditions mentioned above for prototype testing have a direct bearing on our subject, as indicating why quite noticeable changes may be found in A.S.I. readings as between one day and another.

The wise pilot will not test above cloud in which there are insufficient breaks for fairly frequent glimpses of the ground to be seen. (I can say this feelingly, as I have had the experiences of engine failure on one occasion and screaming into fully fine pitch on another above 10/10ths cloud.) There are some pilots who practise the habit of climbing blind, doing a level on instruments, and follow this by a dive still in the cloud. This demonstrates bravery, skill in instrument flying, but a horrifying lack of imagination. After all, one only tests an aircraft because it is thought more likely to develop unexpected faults than one which has been fully proved.

Much has been said about the advantages of equipping aircraft with two-way wireless for test flying. It is suggested that we should be able to find our way back home better in bad weather, and therefore be able to test under worse conditions. This is certainly true, but seems to overlook the fact that no wireless set yet invented can pick out a safe field for forced landing, nor can wireless in any way mitigate the effects of a machine going partially out of control when there is a low ceiling or bad visibility. Indeed, I think there is much to be said, in testing, for the old adage, "No see, no fly."

Technical Training

Work of R.A.F. T.T.C. : Building Character as Well as Skill

By DAVID VINE

THERE has been little publicity for Technical Training Command. Yet its activity has been vital to our air offensive. Men from every walk of life have entered the Royal Air Force to be trained as aircraft mechanics. They have been well trained, passing through the technical training schools, first as flight mechanics, and later, if they have shown aptitude, as fitters.

Most men are interested in engineering and learn the rudiments quickly. So rapid is their first absorbtion of technical knowledge that the R.A.F. considers a man to be ready to begin work as a flight mechanic after only sixteen weeks' concentrated training. Considering that many of these men have never done much engineering work at all, this is a fine achievement. A similar ground engineers' course at a civilian school would take considerably longer and cost far more than the average young man could afford, quite apart from absence of pay during the training period. In the R.A.F. the men are paid the same rate whether under training or working on the squadron.

The object of the Technical Training Courses for flight mechanics is to teach men to service aircraft; do simple metal repairs and carry out daily inspection; fill in forms 700; and handle aircraft without damaging them. Basic or bench work forms a large part of their training, and many men will be thankful for the skill thus gained when they return to civvy street.

Working in the Open

All their practical as well as theoretical attainment can be assessed at the school, but there is one factor which cannot be assessed until later on in the Flights. That is character. It may be asked what character has to do with servicing aircraft. It should be remembered that flight mechanics often work out on dispersal without warmth or shelter of any sort. Maintaining aircraft in a comfortable hangar and servicing aircraft out on dispersal are two totally different things. Out on dispersal, a man must not only have skill and knowledge; he must have patience to work under difficult conditions.

Patience of this sort is a matter of character. One man will work with a cold spanner and frozen hands in a very awkward position, probably for an hour or more, while another might give it up in a few minutes. There is no training for that except in the Flights. This sort of work-training may last but a few months, or it may go on for a year or more, until the man has shown sufficient character for the higher grade. Then, if the man has proved adaptable and has conquered his temperamental aversion to carrying out awkward repairs under difficult conditions, he is posted to a Technical Training School for a further intensive conversion course to convert him from a flight mechanic to a fitter.

This not only means a move up from a Grade II to Grade I trade, but it means higher pay. It also means working in the hangars in considerably less arduous conditions than are met with by the flight mechanics on the Flight dispersals. The equivalent to a flight mechanic in civvy street would be a ground engineer in categories A or C. That is they sign up before flight, after carrying out the daily inspection or the "daily" as they call it on the Flight dispersal. Fitters are men qualified and trained to carry out all inspections after the "daily" up to and including the major overhaul. The Flights also train men for the exacting conditions of front-line war, and may be said to be a form of battle training. It is certainly a hardener and a toughener of fibre. As character training it has few equals. While the Flights harden a man, the schools temper him.

The training of a fitter actually begins on his Flight Mechanics Course. It then continues through the Flight up to his final conversion course at the school. This technical training course is more intensive than the Flight Mechanics Course and takes into consideration the mechanic's wider experience and knowledge. Technical subjects are gone into more thoroughly and in greater detail. More theory is taught and greater opportunity given for practical work. As a rule the flight mechanics are easier to teach, being especially eager for "bags of real gen." They usually have a store of questions to ask concerning snags and difficulties met with during work on the Flights.

Taught and Tough

A R.A.F. fitter passing out high on his conversion course is a fine example of a well-trained man. He is not only well taught but tough. Some men pass from the Flight Mechanics Course soft and flabby in body and mind, but after an interval on the Flights they return to the Conversion Course so improved that a metamorphosis seems to have taken place. Many men now passing through the Technical Training Schools are training to be flight engineers. The schools also train Free French, Belgians, Dutch, Norwegian, Poles and Czechs.

Both training and refresher courses are also run for the instructors. On these courses, corporals, sergeants and civilian instructors are taught the basic elements of teaching; blackboard work; sequence and logical development of subjects; how to demonstrate components; how to speak properly and command the attention of a class; in fact, all the technique necessary for teaching highly technical subjects.

In spite of the almost insuperable difficulties due to the rapidly expanding ground crew personnel, Technical Training Command is tackling the job of training in a really workmanlike way. Many thousands of men have become skilled mechanics, thanks to the excellent organisation of Technical Training Command.

DEATH OF COL. SYDNEY SMITH

CLOSELY associated with the early days of flying, and more particularly with the Bristol company, was Sydney Smith, whose death at the age of 62 was announced recently. In 1910 he obtained his pilot's licence (No. 33) on a Bristol Box Kite biplane, and afterwards he headed a mission to Australia where, it was thought, aircraft would be valuable on the sheep farms for locating the flocks, spotting broken fences, and for similar work.

In 1939 he renewed his acquaintance with Australia by paying another visit. This time it was at the request of the Government in connection with the proposed manufacture in Australia of the Bristol Beaufort general purpose aircraft. The Box Kite of 1910-11 had a speed of about 45 m.p.h. The Beaufort is something like seven times as fast. Such was the progress of flying between Sydney Smith's two visits to Australia for his company.

At the beginning of the war 1914-18 Sydney Smith rejoined his old battalion as major, and in 1915 he was attached to the Royal Flying Corps. He went through the war in the R.F.C. and later in the R.A.F., was mentioned in despatches, and retired with the rank of Colonel.

Col. Sydney Ernest Smith, C.B.E., O.B.E., was a former director and general manager of the Bristol Tramways and Carriage Co., retiring in 1935. He was a member of the firm of George White and Co., stockbrokers, of Bristol, founded by the late Sir George White, Bart., who also formed the British and Colonial Aeroplane Co., now Bristol Aeroplane Co.

Col. Sydney Smith leaves a widow and two daughters. His only son was killed by enemy action in 1940.

Book Reviews

Astronomical Air Navigation, by Sqn. Ldr. R. Hadingham. The Technical Press, Ltd. 10s.

PROVIDING a complete course in astro-navigation for practical navigators, only essential references to the mathematical and theoretical aspect of the subject are included, the author's very reasonable assumption being that few aircrew members will have time to study the less practical methods by which the technique may be applied, involving, for instance, spherical trigonometry, which are of interest only to a few specialists.

Aircraft Navigation, by H. Stewart and A. Nichols. Cambridge University Press. 5s.

NO attempt has been made in this book to cover more than the first steps in the various branches of the subject, the authors' sole aim being to give a concise introduction to the science. It includes a chapter on star identification, and accompanying the book in a separate envelope is a plotting chart and an ivorine circular slide rule for use with the practical exercises which, incidentally, the student is asked not to regard as mere tedious labour; continued and varied practice is the only way to proficiency in navigation.

General Science, by I. R. Vesselo, B.Sc. Hutchinson's. 2s. 6d.

THIS is the first little book in the publishers' "Complete Air Training Course" series, and will be very useful to embryo airmen who have forgotten much of the physics they learnt at school. The author points out that the work of the airman, whether on the ground or in the air, is based on that of the scientist, and he therefore needs a thorough grasp of the foundations underlying the practice of his future trade or profession in aviation. Mechanics, heat, light, and sound are all treated generally, and scientific principles which are applied to aircraft and their instruments are simply explained without too much detail or mathematics in order to provide the essential background for the other subjects which form part of the air training course.

"Synthetic Resins and Allied Plastics" (Second Edition). Edited by R. S. Morrell. Humphrey Millford, Oxford University Press. Price 35s. net.

THE rapid development and uses of synthetic resins and plastics during the past six years has necessitated the second edition of this work. The authors, increased in number, are prominent experts in the plastics industry and have co-operated to give an authoritative representation of the chief sections of the synthetic resins and allied plastics at present being used. In this respect they have been most successful and the work is, without doubt, one of the best so far available.

The aircraft engineer, designer and draughtsman who desire a first-hand work of reference on this subject, and the technique involved in the injection moulding and laminated plastic processes, will find this volume a valuable contribution to their library.

Bombers' Battle. By a Wing Commander, with a foreword by Air Marshal Sir Arthur Harris. Gerald Duckworth and Co., Ltd. 10s. 6d. *net.*

THIS is a most readable book, and as it has been blessed in a Foreword by the A.O.C.-in-C., Bomber Command, the general reader may accept it as an authentic account of the subject treated. It traces the history of how Bomber Command has developed during the first three years of the war. The writer explains many of the difficulties with which the Command has had to grapple. He lays great stress on the difficulties, and Sir Arthur Harris agrees that bombing is among the most difficult of military operations.

The story of the gradual development is enlivened (though perhaps that is hardly the correct word) by numerous stories of the adventures of bomber crews told in detail, while particular operations, such as the attacks on the *Scharnhorst* and *Gneisenau*, are also dealt with at considerable length.

The value of the book is greatly enhanced by the sane and reasonable frame of mind displayed by the author. He is a convinced believer in strategic bombing, but he is no wild fanatic to cry out that if only Britain drops all other activities and concentrates all her energies on this one form of warfare Germany will speedily be beaten to her knees. On the contrary, he sums up the problem calmly and judiciously, as some quotations from his closing chapter show.

"I suppose," he writes, "the final proof of the efficacy of strategic bombing can come only when the enemy goes into battle deficient in some weapon which we knew he would have had if the factory in which it was made had not been destroyed. There is no such proof at the moment, and it could not be expected; the enemy has immense reserve stocks both of weapons and raw materials, and the damage done in the campaign of 1942 cannot be expected to result in an immediate deficiency of any of the most vital weapons or war material. . . . So the campaign of 1942 has answered the question: Can we destroy the German war industries by bombing them? But it has not yet answered the question: Will such destruction of her war industries, defeat Germany? . . . What has happened so far proves—and I do not think that this was proved before the campaign of 1942—that if given numbers we can win the race."

The race, of course, is between the rate of destruction by our bombers and Germany's ability to produce in spite of that destruction. The author concludes: "It is permissible, on the basis of photographic evidence of damage and of the thorough study of the German economic organisation that has lately been made, to believe that a force three or four times the size of that used in 1942 would have proved lethal." But we must still ask whether such a force could have destroyed the reserve stocks as well as all the factories. If not, its lethal effect would not have been produced until all the reserves had been exhausted. We may not be too optimistic if we hope that even before those stocks are exhausted the Navy, the Army, and the Tactical Air Force, plus our Allies, will have won the war.

"Flight" photograph.

IN PROFILE: A North American Mitchell (B25C) at a British terminal airport after having flown the Atlantic from Newfoundland. Mitchells have been extensively used by both the U.S.A.A.F. and R.A.F. in North Africa.

CORRESPONDENCE

The Editor does not hold himself responsible for the views expressed by correspondents. The names and addresses of the writers, not necessarily for publication, must in all cases accompany letters.

TECHNICAL TRAINING

The Fighting Man is Still Important

IN the correspondence columns of *Flight* of May 27th, R. D. Leakey makes some thoughtful comments on the place of engineers in this war.

There is certainly no doubt that the technicians are doing an excellent job, but that is a far cry from declaring the human element non-existent.

Until all weapons are wireless-controlled, the fighting man is, at the very least, as important as the engineer. The part played by automatic machinery has always been overestimated.

Take Mr. Leakey's own example of the torpedo. Has he forgotten the pilot or submarine commander who releases it at the right moment, at the right place?

Strategical skill still plays a large part in the winning or losing of any battle. And in any case there are quite a few highly important jobs where few intricate "tools" are used and the means of success are initiative, courage, and endurance.

To say modern wars are won by engineers is only half the story. Fighting men never forget the builders and designers of their weapons, but neither are they likely to forget the famous remark, "Give us the tools and WE will finish the job." J. H.

BOOST PRESSURE VARIATION

Increased Load the Ruling Factor

THE following is my own, and not in any way an official, answer to this very annoying "Boost Pressure Variation" business. I have read the many ideas of your correspondents on this subject, and, since I have had some experience with Merlins on test beds, may be able to help to clear things.

If an aircraft were stationary on the ground with the engine running and the pitch of the propeller blades were increased, the only appreciable effects produced on the engine would be to increase the load and the packing effect at the air intake.

Now the aneroid capsule of the boost-control unit is subject *only to changes in boost pressure* in this case, since the pilot has not touched his manual throttle control.

Increasing the load on the engine would automatically decrease the r.p.m., thus decreasing the volumetric requirement of the engine to a greater extent than the supercharger delivery would be decreased. Consequently, the boost pressure would tend to rise and be immediately corrected by the boost control unit.

"Packing" at the air intake would also tend to increase the boost pressure and be similarly corrected by the boost control unit.

However, there is naturally a certain amount of friction in the control linkages, servo piston, etc., which tends to slow up the corrective action of the boost-control unit and even to stop it prematurely, thus accounting for the slight rise in boost pressure when the pitch of the propeller is increased slightly. Similarly, the converse applies. H. BICKERTON.

[This correspondence is now closed.—ED.]

LONG-RANGE AIR TRANSPORT

Why Not Seadromes?

POST-WAR air transport is very much in everyone's mind just now, judging from letters and articles in the Press. To Great Britain the Empire air routes and the Transatlantic are the all-important ones. All involve very long distances, which is merely another way of saying that many of the stages to be flown will involve the carrying of large quantities of fuel, with corresponding reduction in payload.

The Atlantic is the obvious case, but even on Empire flights large sea crossings may become desirable. For instance, there is the question of a route from the east coast of South Africa to Australia, across the Indian Ocean.

Surely the use of seadromes, such as the Armstrong and Creed, would be of enormous advantage in reducing the over-sea stages on such routes? With modern radio and other aids to navigation pilots should have no difficulty in finding the seadromes, and the Fleet Air Arm is demonstrating daily the possibility of taking off from and landing on the heaving deck of a carrier. How much simpler it would be to land on the quite steady and longer platform of a seadrome. I realise that the seadrome would be stationary whereas the carrier is steaming into wind, thus virtually reducing take-off and landing speeds, but the greater length of the seadrome should more than make up for this.

Perhaps some of your readers can explain why seadromes have not been developed, although their design is many years old. "ATLANTIS."

[The main obstacle in the way of establishing seadromes is an economic rather than a technical one. The seadrome is probably quite feasible, and aircraft pilots could, with modern aids, possibly land on even in poor visibility. But the cost of a seadrome would be likely to run into millions, and the interest on the capital, depreciation, running expenses and so forth could only be obtained from landing fees. Unless the traffic intensity were such as to be operationally dangerous, these fees would probably exceed the saving resulting from the shorter stages.—ED.]

CIVILIAN AIR SAFETY

There Can be No Sporting Spirit in Total War

IS it not time that we Britons stopped handicapping ourselves in our war against the Axis by still regarding certain actions as "unsporting"?

We were all horrified by the recent shooting down of a B.O.A. airliner, somewhere over the Atlantic, by German warplanes; but isn't that just the sort of thing we must expect? The curiously inconsistent thing about us is that we now accept the bombing and machine-gunning of civilians in the streets of our frontier coast towns by German sneak raiders as being all part of the war, yet when a party of civilians, including women and children (who, incidentally, could hardly have been on official business) lose their lives in the Atlantic at the hands of enemy airmen, we virtually exclaim in indignation: "I say, you know, that's not playing the game!" Yet where is the difference? Patently there isn't any.

Just after the loss of the B.O.A. airliner the story was repeated in at least one London newspaper how there was a sort of tacit understanding that each side should leave its opponent's civil airliners alone, presumably on the score that each of us found Lisbon and Stockholm very useful. Of course, this has been denied with suspicious eagerness every time the suggestion was forced upon the notice of the authorities, but whether true or not it helps to keep alive the absurd idea that some spark of sporting instinct should still glow, however unofficial and however dimly, in this filthy but necessary business of exterminating Fascist vermin from the suffering world.

Personally, I see no logical reason why an R.A.F. pilot should not shoot down any machine of the *Lufthansa* he might encounter, and, in my opinion, he need have not the slightest twinge of conscience if he does; it *might* be carrying Herr Schickelgruber and his Chief Thugs—just as that B.O.A. airliner *might* have been bringing Mr. Churchill back from Algiers! Further than that, such aircraft *might* be taking home information far more valuable to the other side than even the highest placed individual. And even supposing there did exist an unofficial agreement to ignore each other's civil airliners, surely we know that the Germans would violate it whenever they thought it might be worth their while.

The probability that some such understanding did exist is clearly indicated by the fact that B.O.A. have plied to and fro between this country and Lisbon for so long without previous interference. For it cannot be denied that the Germans, whose aircraft use the same airfield, must always have known exactly when our aircraft were leaving, and nothing could have been easier than for the *Lufthansa* at Lisbon to tip off the *Luftwaffe* (its own illegitimate offspring!) every time a B.O.A. aircraft left the airport.

All that we can reasonably be surprised about is that this was the first British civil airliner from Lisbon to be so attacked, and that we apparently depended upon the Hun playing the British idea of a gentleman to such a ridiculous degree that we flew the crossing in daylight instead of under the protective cover of night. "REALIST."

Front Line Air

Troops and Supplies Moved Thousands of Miles : Wounded Hurried Back to Base Hospitals : Complete Field Hospital Replaced by Air

1. A Douglas D.C.3 on a desert airfield. In the background is a row of Lockheed Hudsons.

2. Before emplaning, an officer of a Highland regiment chats to the pilot of a transport Hudson. In the group is also a sergeant air gunner and a corporal of the Royal Tank Regiment.

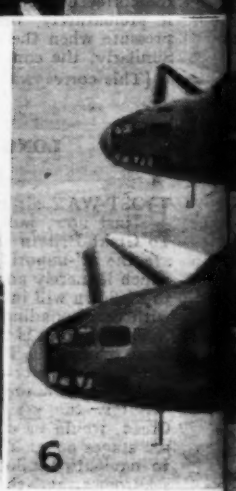
AIR transport has played a vital part in the task of clearing the Axis out of North Africa. At the time of El Alamein when the outlook was so desperate A.W. Ensigns were crossing Africa full of ammunition and loaded up to 66,000 lb.—their normal loading is 52,500 lb. As the Eighth Army advanced the lines of communication became ever more attenuated and more and more use was made of the Air Transport Service, as it is termed.

R.A.F. equipment was moved to forward landing grounds within hours of their evacuation by the enemy. Specialised troops and supplies were taken to urgent destinations in a fraction of the time which would have been taken by ground transport.

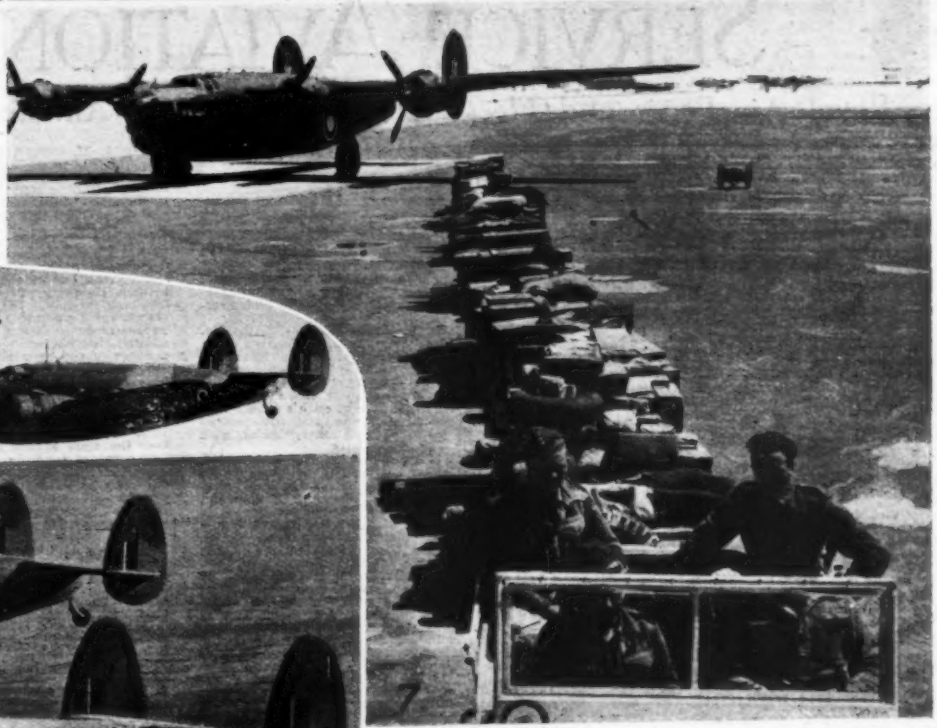
On return journeys, wounded men requiring urgent treatment at base hospitals were carried in large numbers. This was one of the main reasons for the low death rate among casualties. One hospital, for instance, had only five deaths among 1,500 severely wounded men.

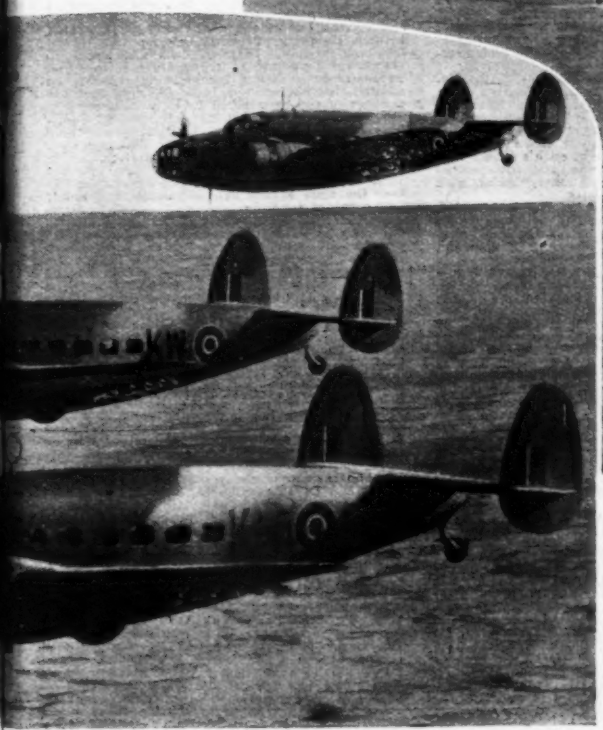
Altogether more than 15,000 wounded and sick cases were transported by air, the record number moved in any one day being over 700 officers and men. One of the biggest tasks undertaken was the replacement of a United States Army Air Force hospital which had been lost by enemy bombing. A new hospital complete in every detail was flown to them in 80 aircraft loads.

The unofficial motto of the Air Transport Service is "We deliver the goods."



1. Highland troops, in full equipment and with bedding rolled up, wait the order to get aboard. This order is not given until the last minute because metal aircraft get extremely hot inside while standing on the desert.



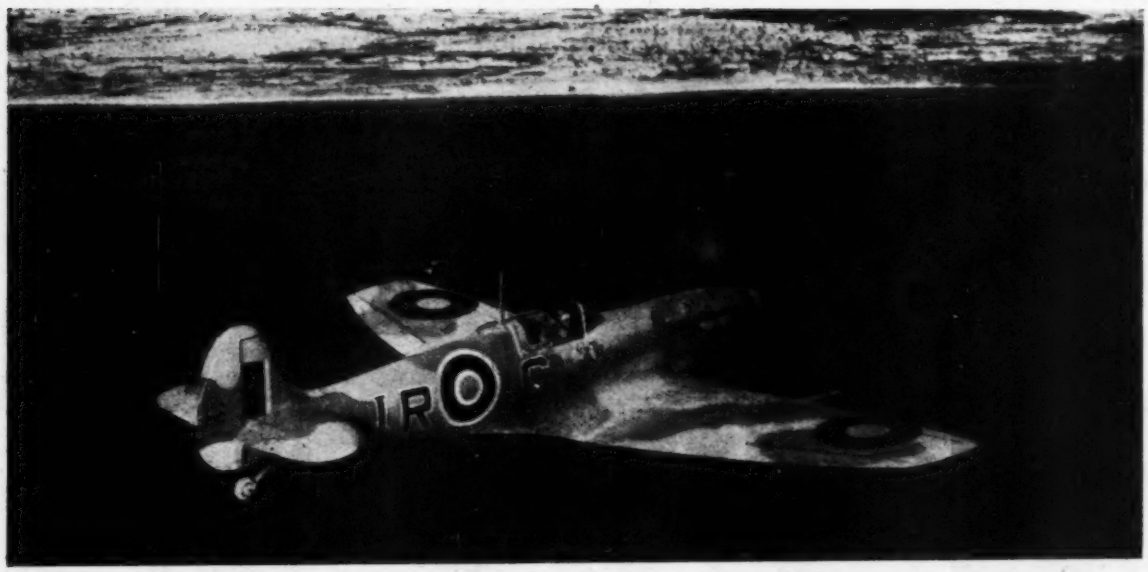


4. Putting a stretcher case on board one of the transport aircraft.

5. In the control room of air transport H.Q. The service was highly organised and run in the manner of a super airline.

6. Three Hudsons in formation. To save weight no turrets were carried. This would have been impossible had not the Allies secured air superiority over the battlefields and the lines of communication.

7. A "trainload" of air-transported supplies passes a Consolidated Liberator on a desert airfield.



Wing Cdr. Ian R. Gleed, D.S.O., D.F.C., flying his clipped-wing Spitfire IR-G over North Africa shortly before he was posted as missing.

SERVICE AVIATION

Royal Air Force and Fleet Air Arm News and Announcements

Tactical Air Force Formed

DURING one of his visits to Africa the Prime Minister was impressed by the work of the North African Tactical Air Force and he directed that immediate steps were to be taken to build such an air arm within the Metropolitan Air Force. This new force has already been formed and was tried out during the large-scale inter-service exercises held in March of this year.

The Air Ministry now makes the following official announcement.

As a result of experience gained in the fighting in North Africa certain measures of reorganisation have been effected in the metropolitan air force.

The Army Co-operation Command, which was formed in December, 1940, to organise, experiment and train in all forms of land/air co-operation, has been merged into a Tactical Air Force designed to work with the army in the field. The organisation of this force conforms closely with that of the Tactical Air Force under Air Marshal Sir Arthur Coningham in North-West Africa.

The Tactical Air Force is located in Fighter Command in order to ensure close integration of the work of the tactical reconnaissance aircraft and light bombers with that of the main fighter force.

Air Vice-Marshal John Henry D'Albiac, C.B., D.S.O., will command the new force, and the following higher appointments are also announced:

Air Marshal Sir Arthur Sheridan Barratt, K.C.B., C.M.G., M.C., formerly Air Officer Commanding-in-Chief, Technical Training Command, to be Air Officer Commanding-in-Chief, Technical Training Command.

Air Marshal Sir John Tremayne Babington, K.C.B., C.B.E., D.S.O., formerly Air Officer Commanding-in-Chief, Technical Training Command, to be head of the Royal Air Force mission in Moscow.

Promotion

GENERAL DUTIES BRANCH.

Group Capt. (Act. Air Comdre.) B. E. EMBRY, D.S.O., A.F.C., A.D.C., to be Act. Air Vice Marshal, June 1st, 1943.

Awards

THE KING has been graciously pleased to approve the following awards in recognition of gallantry and devotion to duty in the execution of air operations:—

Distinguished Flying Cross

Sqn. Ldr. G. G. AVIS, R.A.F.O., No. 57 Sqn.—Among his operational sorties are attacks on heavily defended enemy targets, such as Berlin, Essen, Hamburg, Genoa, Turin and Milan. One night in January, 1943, this officer's aircraft was hit by anti-aircraft fire when making his bombing run over Essen, one engine becoming unserviceable. Nevertheless, Sqn. Ldr. Avis successfully completed his mission and flew safely back to base with three engines. Some weeks later, when returning from Essen his aircraft was attacked by an enemy fighter and suffered considerable damage. By skilful evasive action Sqn. Ldr. Avis brought his aircraft out of danger and enabled his rear gunner to damage the Me 210.

Sqn. Ldr. L. J. BIRCHALL, R.C.A.F., No. 413 (R.C.A.F.) Sqn.—This officer was the first to sight and report the approach of the Japanese naval forces which attacked Ceylon. His timely warning enabled preparations to be made which resulted in considerable losses to the enemy.

Act. Flt. Lt. D. K. ALLPORT, R.A.F.V.R., No. 35 Sqn.—Flt. Lt. Allport has completed a large number of successful operations against the enemy. His fine record as a navigator has been achieved by the exercise of outstanding skill and courage.

Act. Flt. Lt. L. W. D. FAGAN, R.A.F.V.R., No. 10 Sqn.—Flt. Lt. Fagan is now on his second tour of operational duty. For the past five months he has served as squadron gunnery leader with marked ability and enthusiasm.

Act. Flt. Lt. S. R. WHIPPLE, R.A.F.V.R., No. 102 Sqn.—This officer has participated in numerous successful sorties, including attacks on such well-defended targets as Berlin, Bremen, Cologne and Essen.

F/O. F. E. ALDER, R.A.F.V.R., No. 78 Sqn.—This officer has completed 27 operational sorties, some of which have been against targets in the enemy's most heavily defended areas.

F/O. P. B. BALLANTYNE, R.A.F.V.R., No. 97 Sqn.—F/O. Ballantyne, as wireless operator/air gunner, has completed a successful tour of operational duty during which he has taken part in attacks on most of the very heavily defended German targets, including Essen, Cologne and Berlin. He has also participated in several long-distance attacks on Italian targets.

F/O. J. N. CATTY, R.A.F.V.R., No. 49 Sqn.—As navigator this officer has taken his aircraft to a variety of enemy targets from the Baltic to Germany, Italy and France.

F/O. J. P. CREBBIN, No. 9 Sqn.—As air gunner this officer has participated in many operational sorties against the enemy. He has inspired complete confidence in his crew and his vigilance and coolness on many occasions enabled his captain to avoid attacks from enemy fighters.

F/O. R. FELL, R.A.F.V.R., No. 10 Sqn.—In November, 1943, when returning home from Genoa, on three engines, F/O. Fell's aircraft crashed and burst into flames. With an utter disregard for his personal safety this officer succeeded in extricating his injured comrades and dragging them clear of the blazing aircraft. He was himself taken to hospital later suffering from bruises and burns to head and face. On another occasion, when on the way to the target, the wireless apparatus broke down, but F/O. Fell, showing fine technical skill, succeeded in repairing the set, thus materially contributing to the successful completion of the mission.

F/O. J. M. GRANT, R.A.F.V.R., No. 49 Sqn.—This officer is a highly experienced wireless operator. His missions, which have all been performed within a very short space of time, have been mainly directed against important and heavily defended targets such as Berlin, Essen and Hamburg.

F/O. D. W. GRIFFITHS, R.A.F.V.R., No. 466 (R.A.A.F.) Sqn.—This officer has been engaged in operational flying in different types of aircraft and against a wide variety of targets, which include Hamburg, Bremen, Cologne and Genoa. One one occasion F/O. Griffiths was forced to abandon his aircraft by parachute and to spend 14 hours in a dinghy before being rescued; on another, his aircraft was badly damaged and one member of the crew killed by anti-aircraft fire.

F/O. J. D. JOHNSTON, R.C.A.F., No. 78 Sqn.—This officer has invariably displayed a very keen desire to proceed on operations. Although now mainly employed in ground organisation, he is, at all times, willing to fly as wireless operator with any crew, and has completed many sorties over the more heavily defended areas of Germany and occupied territory.

F/O. W. B. KIRKWOOD-HACKETT, R.A.F.V.R., No. 97 Sqn.—This officer has completed a large number of operational missions as air gunner. Many of these have been attacks on heavily defended targets in the Ruhr, Berlin and Gdynia. He also took part in the 1,000-bomber raids on the Ruhr and Cologne and in the daylight raid on Milan.

F/O. F. G. G. LUSH, R.A.F.V.R., No. 97 Sqn.—This officer has participated in a number of successful operational sorties against objectives in Germany and Italy. Excellent photographs have invariably been obtained which give evidence of a high degree of team work.

F/O. H. MOORHEAD, R.A.F.V.R., No. 9 Sqn.—This officer has taken part in many long and arduous flights, including the daylight raids on Milan and Le Creusot and low level attacks on targets in Germany. On many occasions his vigilance and calmness have enabled his captain to avoid attacks from enemy night fighters.

F/O. C. D. PERKINS, R.C.A.F., No. 9 Sqn.—Included in his many sorties are raids on Genoa, Turin, Munich and Berlin; he also took part in daylight attacks on Le Creusot and Milan.

F/O. A. T. SPENCER, R.A.F.V.R., No. 78 Sqn.—This officer has invariably displayed great courage and coolness in the execution of his duties as navigator. He has always co-operated well with his captain.

F/O. T. TRILSBECK, R.C.A.F., No. 97 Sqn.—F/O. Trilsbeck has completed many operational sorties as air gunner in a very successful crew. His targets have included such heavily defended centres as the Ruhr, Berlin, Turin and Genoa.

F/O. W. WATTS, R.A.F.V.R., No. 49 Sqn.—This officer has navigated his aircraft with coolness and determination in the face of adverse weather and strong enemy opposition. Despite any difficulty he has completed all his missions accu-

rately and navigated the aircraft successfully back to base.

P/O. F. C. BALL, No. 49 Sqn.—This officer, as wireless operator-air gunner, has taken part in operations against many of the more heavily defended enemy targets. P/O. Ball has been of the utmost assistance to his captain and crew when attacked by enemy fighters.

P/O. L. H. EDWARDS, R.A.F.V.R., No. 44 Sqn.—P/O. Edwards has completed his allotted tasks with coolness and courage on every occasion. His efficiency as a navigator has frequently enabled his captain to reach and bomb his objective despite heavy opposition and adverse weather.

P/O. P. K. HOPKIN, R.A.F.V.R., No. 49 Sqn.—P/O. Hopkin took part in the daylight attacks on Le Creusot and Milan. In addition, he has participated in raids on targets in Germany and Italy, often in the face of heavy opposition.

P/O. J. J. MIESEN, R.C.A.F., No. 9 Sqn.—This officer has participated in a large number of operational sorties. As air bomber he has always taken the greatest pains to locate and bomb his targets undeterred by adverse weather or heavy opposition.

P/O. A. PEARSON, R.A.F.V.R., No. 50 Sqn.—This officer has participated in raids on most of the heavily defended German targets as well as in the daylight raid on Le Creusot.

P/O. G. R. POOL, R.C.A.F., No. 76 Sqn.—This officer has taken part as navigator in attacks on Berlin, Bremen, Duisberg and Cologne. He also participated in a low level attack on Flensberg where extremely heavy anti-aircraft opposition was encountered.

P/O. W. PRESTON, R.A.F.V.R., No. 10 Sqn.—On one occasion, when returning from operations, his aircraft struck a tree on a high mountain ridge and the crew had to bale out. In spite of this and other harassing experiences, P/O. Preston has continued to proceed on operations with enthusiasm.

P/O. D. ROGERS, R.A.F.V.R., No. 9 Sqn.—P/O. Rogers has taken part in many operational sorties against the enemy. He has invariably displayed efficiency and ability of a high order in his duties as wireless operator-air gunner.

W/O. N. A. BOTTING, No. 49 Sqn.—This officer's work has been of a very high standard, and as navigator he invariably brings his aircraft to the target exactly on time.

W/O. S. DAVIES, R.A.F.V.R., No. 113 Sqn.—This warrant officer has operated in Eritrea, Middle East and Burma, where he has participated in many low level raids on heavily defended targets. He has flown as navigation leader and bomb aimer in most of the recent formation sorties on Burma, where his excellent navigation has been of great value.

Bar to Distinguished Flying Medal

Sgt. N. F. WILLIAMS, D.F.M., R.A.A.F., No. 10 Sqn.—Since being awarded the D.F.M., Sgt. Williams has completed numerous sorties, during which he has attacked targets at Turin, Genoa, Cologne, Hamburg, Essen and Berlin.

Flt. Sgt. G. D. AITCHESON, D.F.M., R.C.A.F., No. 78 Sqn.—On one occasion, he both navigated the aircraft and bombed the target during an attack on the submarine base at Lorient, thereby completing a most successful operation. Whatever the opposition, he invariably guides his captain to the centre of the target before releasing his bombs.

Flt. Sgt. G. G. BELLAMY, D.F.M., No. 49 Sqn.—This airman has completed twenty-seven sorties against targets in the Ruhr, Essen, Berlin, the Baltic and Italy. As navigator he participated in the daylight attack on Le Creusot. He has contributed in a large measure to the many successes achieved by his crew and the excellent photographs obtained.

Distinguished Flying Medal

Sgt. C. E. QUINN, No. 207 Sqn.—Sgt. Quinn has successfully completed a tour of operations during which he has attacked many heavily defended targets. On one occasion, when returning from Essen, the aircraft in which he was flying was attacked by an enemy fighter. It was largely owing to Sgt. Quinn's clear and accurate instructions and his effective fire that the attacker was driven off and the bomber enabled to return safely.

Sgt. P. A. SOMERVILLE, No. 218 Sqn.—Sgt. Somerville has taken part in attacks on some of the enemy's most heavily defended targets. During a recent attack on Stuttgart, Sgt. Somerville sustained severe wounds in his hand and leg, but with great fortitude refused to leave his turret until base was reached.

Sgt. W. C. TOWNSEND, No. 49 Sqn.—Sgt. Townsend has operated against targets in Italy, Northern France and Germany; in addition, he has taken part in several mine-laying missions. On one occasion, on the outward flight to Dusseldorf, one engine of his aircraft failed, but Sgt. Townsend continued his mission and later bombed the objective successfully, afterwards flying the aircraft safely back to this country.

Sgt. S. TROWSDALE, No. 27 Sqn.—Sgt. Trowsdale has completed many successful sorties against some of the enemy's most heavily defended areas, including Essen, the Ruhr, Berlin, and targets in Italy. He also participated in the daylight raids on Le Creusot and Milan.

Sgt. J. T. WALSH, No. 156 Sqn.—Sgt. Walsh, on his second tour of operational duty, has participated in a large number of sorties against targets in Germany and occupied territory.

Sgt. A. WESTWELL, No. 97 Sqn.—This airman has completed many operational sorties against strongly defended targets in Germany and Italy. He has attacked Berlin on three occasions and Italian industrial centres five times.

Sgt. S. J. WHITTINGHAM, No. 214 Sqn.—On the night of 28th February, 1943, his aircraft was

SERVICE AVIATION

twice hit by anti-aircraft fire when attacking St. Nazaire. A shell burst close to the starboard fuselage, causing damage and blowing in the windows on that side of the aircraft. It was discovered that smoke and flames were coming from the closed doors of the bomb compartment. Despite the flames, Sgt. Whittingham persevered and successfully released by hand a container of ignited incendiary bombs. He also closed the jammed bomb doors by hand.

Flt. Sgt. T. B. BLACKBURN, R.N.Z.A.F., No. 141 Sqn.—As navigator, this airman has displayed exceptional skill. In April, 1943, he was the observer of the leading aircraft of a section which successfully attacked an enemy convoy. By his accurate navigation, Flt. Sgt. Blackburn played a large part in the success achieved.

Flt. Sgt. W. J. CEYBIRD, No. 143 Sqn.—In May, 1943, Sgt. Ceybird piloted an aircraft engaged on a reconnaissance flight off the Norwegian coast. Enemy fighters attempted to intercept and, in the ensuing engagement, Sgt. Ceybird fought off two enemy aircraft with great daring. His observer was killed during the action, but Flt. Sgt. Ceybird, although deprived of navigational assistance, flew his aircraft more than 300 miles over the sea to reach an airfield in this country. He displayed courage and determination of a high order.

Flt. Sgt. J. E. COPE, No. 115 Sqn.—In most hazardous circumstances, during an operational flight, this airman displayed conduct in keeping with the highest tradition of the R.A.F.

Wing Cdr. J. E. Johnson, D.F.C., who has been awarded the D.S.O.

Sgt. R. H. WRIGHT, No. 149 Sqn.—One night in March, 1943, this airman was the flight engineer of an aircraft detailed to attack Nuremburg. Shortly after crossing the enemy coast, on the outward flight, the aircraft was attacked by an enemy fighter. The fuselage caught fire amidships. As the pilot commenced to take evading action, two of the bombers engines failed and the aircraft temporarily went out of control. Petrol was pouring into the fuselage but Sgt. Wright, who had been hurled against the bulkhead door, displayed great promptitude and struggled to the petrol cocks, taking measures to counteract the danger. The pilot regained control of the aircraft and succeeded in restarting one of the faulty engines. Thereupon Sgt. Wright turned his attention to the fire in the fuselage, putting out the flames with an extinguisher.

Flt. Sgt. G. O. P. BOWEN, No. 192 Sqn.—Flt. Sgt. Bowen has been actively engaged on flying duties since January, 1940. Throughout his flying career he has displayed exceptional coolness and skill.

Flt. Sgt. C. H. BULLOCH, R.C.A.F., No. 10 Sqn.—His aircraft has twice been attacked by enemy fighters, one of which was destroyed. On several other occasions Flt. Sgt. Bulloch's aircraft has been badly damaged, making the return journey on three engines. Despite these hazardous experiences this airman has been conspicuous for his unflagging enthusiasm for operations and cheerful, cool composure in times of stress.

Flt. Sgt. L. J. BURPEE, No. 106 Sqn.—This airman has successfully completed a number of operational sorties against targets which include the naval ports of Wilhelmshaven, Bremen and Hamburg, and also industrial centres in Italy. He has also taken part in raids on Berlin, Nuremberg and Stuttgart. From raids on Lorient and St. Nazaire he secured valuable photographs.

Flt. Sgt. F. S. COPESTAKE, No. 49 Sqn.—As navigator to a section leader in his squadron Flt. Sgt. Copestake participated in the attack on Le Creusot. He has also successfully navigated his aircraft to the Baltic, to targets in Germany, Italy and France.

Flt. Sgt. D. W. CUTHBERT, R.A.A.F., No. 78 Sqn.—Flt. Sgt. Cuthbert has completed 27 operational sorties. A first-class wireless operator, he has always displayed exceptional coolness and fearlessness in the face of danger.

Flt. Sgt. D. M. De SILVA, R.C.A.F., No. 218 Sqn.—Flt. Sgt. De Silva has been engaged on operational duties since May, 1942, and took part in the "1,000 bomber" raids on the Ruhr and Cologne. On one occasion, while on mine-laying operations in the Baltic, the aircraft, in which Flt. Sgt. De Silva was flying as rear gunner, was heavily engaged by anti-aircraft ships and sustained severe damage. By his very accurate gunnery, this airman was instrumental in preventing further damage to his aircraft. On more than one occasion Flt. Sgt. De Silva has attacked and set on fire locomotives on enemy territory, and once, while on a sortie against Wilhelmshaven, drove off an enemy fighter though wounded in the hand.

Flt. Sgt. D. W. HELPS, No. 51 Sqn.—Flt. Sgt. Helps has taken part in a large number of operational sorties and anti-submarine patrols. He has attacked some of the enemy's most heavily defended targets, including Berlin and Cologne. On one occasion the aircraft in which he was flying suffered severe damage from anti-aircraft fire, and another time his aircraft was forced down on to the sea some distance from the shore in adverse weather. It was largely owing to the calmness and accuracy with which Flt. Sgt. Helps sent out his distress signals that an early rescue was effected. Later, in July, 1942, his aircraft was attacked by enemy fighters in daylight. In the ensuing engagement, in which the attacker was probably destroyed and his own aircraft received damage, this airman again exhibited exceptional coolness and courage.

Flt. Sgt. A. M. HORNE, R.C.A.F., No. 49 Sqn.—Flt. Sgt. Horne, as air gunner, participated in the 1,000 bomber raid on Cologne, and since has attacked most of the most important targets in Germany and Italy. He took part in the daylight raid on Milan with great success, all his bombs scoring hits on the target. Recently, in March, 1943, this airman flew in a very successful attack on Berlin.

Flt. Sgt. R. E. JEFFREY, No. 51 Sqn (since deceased).—Flt. Sgt. Jeffrey has participated as air gunner in numerous operational sorties. During missions to such heavily defended targets as Berlin, Hamburg and Cologne, and on anti-submarine patrols, he has displayed great skill, courage and determination whatever the opposition encountered.

Running Commentaries

Flt. Sgt. B. J. MIDDLETON, R.A.A.F., No. 49 Sqn.—This airman has completed thirty-one operational sorties, many of which have been attacks on Berlin, Essen and the Ruhr. As wireless operator/air gunner he took part in the daylight raids on Le Creusot and Milan. When engaged by enemy night fighters his prompt and correct commentary has frequently enabled his captain to take measures which have resulted in the safe return of the aircraft.

Flt. Sgt. H. W. MILLS, No. 49 Sqn.—Flt. Sgt. Mills has taken part in many operational sorties, including daylight attacks on Le Creusot and Osnabruck. During the raid on Le Creusot it was due largely to his valuable assistance that excellent results were obtained. On several occasions the aircraft in which this airman has been engaged as air gunner has been attacked by enemy fighters, both by day and night. Flt. Sgt. Mills has at all times met these attacks with coolness and the calm, unhurried courage with which he directs the necessary defensive measures is remarkable.

Flt. Sgt. D. R. PEARCE, R.C.A.F., No. 78 Sqn.—This airman has taken part in numerous operational flights. He has invariably displayed outstanding efficiency.

Flt. Sgt. J. H. REAVILL, No. 10 Sqn.—On one occasion, when the wireless inter-communication became unserviceable, Flt. Sgt. Reavill reassembled the apparatus in little over an hour. At a very early stage in his tour of operations his aircraft sustained severe damage in an encounter with an enemy fighter.

Flt. Sgt. T. R. D. SMITH, No. 10 Sqn.—Flt. Sgt. Smith has completed a successful tour of operational duty, flying in operations against some of the enemy's most heavily defended targets. Although his aircraft has twice been heavily damaged by enemy fighters, one of which was destroyed, this airman has been conspicuous for his unflagging enthusiasm.

Flt. Sgt. J. E. TAYLOR, No. 50 Sqn.—Flt. Sgt. Taylor has completed successful raids on many heavily fortified targets in Germany. As pilot he took part in the successful daylight operations against Le Creusot and Milan, during which he secured valuable photographs.

Flt. Sgt. R. J. WHITE, R.C.A.F., No. 78 Sqn.—Flt. Sgt. White, as navigator, has participated in attacks on some of the enemy's most heavily defended targets. His operational career has been marked by the exceptional coolness he has shown in times of danger and stress.

Flt. Sgt. G. WILSON, No. 90 Sqn.—On a recent sortie his aircraft was attacked by an enemy night fighter, but by skilful evasive action he was able to bring his bomber safely to base without damage.

Flt. Sgt. I. A. WOODWARD, R.N.Z.A.F., No. 61 Sqn.—He has completed many sorties, including attacks on such targets as Berlin, Cologne, Munich, Essen and Hamburg, invariably pressing home his bombing with vigour.

SERVICE AVIATION

Flt. Sgt. F. R. ZULAUF, R.C.A.F., No. 78 Sqn.—A highly efficient bomb aimer, he has consistently displayed great determination and courage in pressing home his attacks on some of the enemy's most heavily defended targets.

Act. Flt. Sgt. P. E. TURNER, No. 7 Sqn.—Flt. Sgt. Turner is a most trustworthy member of air crew. Throughout many operational sorties over strongly defended areas in Germany he has been of great assistance to his captain.

Sgt. S. W. ARCHER, No. 97 Sqn.—Sgt. Archer, as flight engineer, has taken part in attacks on targets at Essen, Berlin and the majority of the other most heavily defended objectives in Germany. He has also flown on long-distance raids on Italy.

Sgt. T. A. ARMSTRONG, No. 49 Sqn.—Although a fully trained navigator, Sgt. Armstrong has executed his task as an air bomber with thoroughness and efficiency, displaying a marked aptitude for placing his bombs correctly on the target as shown by excellent photographs obtained.

Sgt. R. H. BALDWIN, No. 10 Sqn.—Sgt. Baldwin's aircraft has twice been very badly damaged by enemy fighters, and on several other occasions has returned on three engines, but he has always remained unruffled however hazardous the circumstances.

Sgt. W. J. BALL, No. 49 Sqn.—As air gunner, Sgt. Ball has taken part in operations against all the important German and Italian targets, and also in the daylight attacks on Le Creusot and Milan. His prompt and efficient commentaries on enemy gunfire have often enabled his captain to take immediate evasive action. On one occasion when returning from Stuttgart the aircraft descended to a very low level and effectively attacked two large trains.

Sgt. C. E. BOSWELL, No. 49 Sqn.—A map-reader of great skill and experience, and a most determined air bomber, Sgt. Boswell has completed a large number of operational sorties, including attacks on targets in the Ruhr, Essen, Berlin and Hamburg. He also took part in the daylight attack on Le Creusot and Milan.

Sgt. A. W. E. CARTWRIGHT, No. 106 Sqn.—Sgt. Cartwright has taken part in operations at times penetrating as far as Poland. His operational missions have included the "1,000 bomber" raids, many sorties over the Ruhr, and the daylight raids on Milan and Danzig. On several occasions he has flown as photographic operator and has secured excellent pictures of bombing raids.

Sgt. A. CHANNON, No 97 Sqn.—Sgt. Channon has completed a tour of operational duty during which he has participated in sorties against heavily defended targets in the Ruhr, Berlin and Italy.

Sgt. R. G. COLE, No. 49 Sqn.—When making a low-level attack, recently, on a target in Germany, the aircraft was badly damaged by anti-aircraft fire. Three of the crew were injured and the flying instruments put out of action. By his ingenuity and efficiency, however, Sgt. Cole was able to improvise repairs with the aid of rubber tubing, wire and pins, which enabled the aircraft to make a safe landing by night.

Sgt. W. A COLSON, No. 9 Sqn.—Sgt. Colson took part in the daylight raids on Le Creusot and Milan, and in attacks on all the more heavily defended areas in Germany.

Sgt. P. DEVINE, No. 15 Sqn.—Sgt. Devine is employed as rear gunner of a heavy bomber aircraft, and in this capacity has invariably acquitted himself with skill and outstanding courage. On a recent sortie he shot down an enemy aircraft.

Sqn. Ldr. D. Iveson, who has seen service from Norway to the Middle East, now has a Bar to his D.F.C.

Sgt. C. H. DOSWELL, No. 9 Sqn.—As flight engineer, Sgt. Doswell has completed a large number of operational sorties. He has attacked the majority of the most heavily defended and distant targets in Europe.

Sgt. F. W. DOUGLAS, No. 78 Sqn.—Sgt. Douglas has taken part in many operational sorties. An extremely able flight engineer, he has consistently displayed the greatest coolness and devotion to duty.

Sgt. C. E. FRANKLIN, No. 49 Sqn.—Undeterred by adverse weather, enemy fighter and ground opposition, Sgt. Franklin has displayed a marked determination and precision to locate and bomb his targets, often necessitating several runs over the target area.

Sgt. E. G. GIBBS, No. 76 Sqn.—As rear gunner, Sgt. Gibbs has flown on a large number of operational sorties. He took part in a low-level attack on Flensburg, despite intense enemy opposition, and has also attacked such heavily defended targets as Wilhelmshaven, Hamburg, the Ruhr and Berlin.

Sgt. B. A. GUMBLEY, R.N.Z.A.F., No. 49 Sqn.—This airman has completed a large number of operational sorties within a comparatively short time. His missions have been attended with a considerable measure of success.

Sgt. W. F. GUY, No. 97 Sqn.—This airman has completed numerous operational sorties over such strongly defended targets as Berlin and Essen. He has also flown as wireless operator-air gunner on long-range attacks on Gdynia and Italian industrial centres.

Sgt. G. E. IRONS, No. 78 Sqn.—This airman has completed 26 operational sorties, several of which have been over the most heavily defended areas of Germany.

Sgt. J. H. JONES, No. 78 Sqn.—Sgt. Jones has participated in a large number of operational sorties, often in the face of intense enemy opposition.

Sgt. J. F. JORDAN, No. 97 Sqn.—This airman has completed numerous operational missions over heavily defended German and Italian targets.

Sgt. W. KERR, No. 106 Sqn.—Sgt. Kerr has participated in attacks against many of the enemy's most important and heavily defended targets, including Bremen, Dusseldorf, Kassel, Munich, Essen and Berlin. He has also flown on operations against Italian targets and on mining sorties. One night in August, 1942, when Sgt. Kerr's aircraft was attacked by a Ju 88, his prompt and accurate fire frustrated the attack.

Outstanding Efficiency

Sgt. J. H. LEWIS, No. 10 Sqn.—Throughout his operational career, he exhibited outstanding efficiency as a navigator, and never failed to guide his aircraft straight to the target and back to base. Although on several occasions his aircraft was damaged by anti-aircraft fire, and on one occasion was attacked by six enemy fighters, Sgt. Lewis continued to display cheerfulness, confidence and great keenness for operations. He has frequently secured good photographs.

Sgt. K. LYONS, R.A.A.F., No. 50 Sqn.—Since Sgt. Lyons was posted to this squadron he has taken part in operations over many very heavily defended areas in enemy territory. In October, 1942, he participated effectively in the daylight raids on Le Creusot and Milan.

Sgt. A. R. MCALHONE, No. 97 Sqn.—This airman has completed three raids on Berlin, and has attacked Italian industrial centres several times. Other targets have included very strongly defended objectives in the Ruhr and Western Germany.

Sgt. F. MARTIN, No. 97 Sqn.—As air gunner, he has completed a large number of raids, many of which have been attacks on Essen and other heavily defended objectives in the Ruhr. He has also taken part in long-distance sorties to Italian centres and to Gdynia and Berlin.

Sgt. E. A. MORRIS, No. 49 Sqn.—Sgt. Morris took part, as air bomber, in daylight attacks on the *Scharnhorst* and *Gneisenau*, and in the raids on Le Creusot and Milan. He also participated in the "1,000 bomber" raid on Cologne and in other attacks on heavily defended German targets.

Sgt. H. E. PEARCE, No. 44 Sqn.—Sgt. Pearce has at all times shown a very high standard of efficiency as a bomb aimer. He has also obtained some excellent photographs.

Flt. Sgt. J. PASS, No. 49 Sqn.—This airman has completed 19 operational sorties, including two daylight attacks on Le Creusot and Osnabruck. On one occasion, when serious compass trouble developed, his fine technical skill enabled the navigator to continue on the course and successfully complete the mission.

Sgt. C. QUINE, No. 10 Sqn.—Although his aircraft has been damaged by anti-aircraft fire on several occasions, once returning with twenty-eight holes in the fuselage, this airman has always remained completed unruffled. In November, 1942, the aircraft in which Sgt. Quine was returning from Genoa crashed and he was dragged out of the blazing wreckage in a dazed condition suffering from burns to head and hands.

Sgt. E. A. ROBERTS, No. 61 Sqn.—As air bomber he has participated in raids on Berlin, Hamburg, Essen and Bremen, as well as attacks on many important targets in Italy. Many of these have been completed in the face of heavy opposition but, undeterred by danger, Sgt. Roberts has, on numerous occasions, secured valuable photographs.

Sgt. W. ROBINSON, No. 10 Sqn.—Throughout all his sorties he has been an able and efficient flight engineer. Though on several occasions his aircraft has returned in a badly damaged condition, he has continued to operate with unflagging enthusiasm.

A Bar to his D.F.C. has been awarded to Flt. Lt. J. H. Kenny.

Sgt. A. H. RUDGE, No. 49 Sqn.—Sgt. Rudge has taken part in a large number of sorties over enemy territory, including some of the most heavily defended targets such as Berlin, Dusseldorf, Hamburg and Essen. On one occasion, while his aircraft was illuminated by searchlights and his captain was devoting his energies to combatting this menace, they were attacked by a night fighter. Faced with this double hazard Sgt. Rudge calmly and efficiently frustrated the attacker at the same time assisting and directing his captain and thus enabling the aircraft to complete the sortie and return safely to base.

Sgt. W. T. TROTMAN, No. 78 Sqn.—As bomb aimer Sgt. Trotman has completed a large number of sorties, some of which have been against the most heavily defended targets in Germany. Invariably he has shown great perseverance and coolness in the face of the enemy and has obtained some excellent photographs.

Sgt. P. WALKER, No. 78 Sqn.—Sgt. Walker, as flight engineer, has taken part in operational sorties against targets in Italy and some of the most heavily defended areas in Germany.

Sgt. H. L. WALTERS, No. 49 Sqn.—This airman has taken part in a large number of operational sorties, including attacks on the heavily defended targets of the Ruhr and Berlin. As air gunner he also participated in the daylight raids on Le Creusot and Milan. On one occasion his aircraft was engaged by searchlight and ground defences and badly damaged. Most of the crew were injured and a large portion of the rear of the aircraft was blown away. Despite this Sgt. Walters continued calmly to man his guns, thus playing a large part in the safe return of the aircraft to base.

Sgt. W. C. WHITE, No. 49 Sqn.—Sgt. White has taken part in attacks over Germany, French and Italian targets proving a particularly capable and determined member of his crew.

Roll of Honour

Casualty Communiqué No. 244.

THE Air Ministry regrets to announce the following casualties on various dates. The next of kin have been informed. Casualties "in action" are due to flying operations against the enemy; "on active service" includes ground casualties due to enemy action, non-operational flying casualties, fatal accidents and natural deaths.

Of the names in this list 100 are second entries giving later information of casualties published in earlier lists.

Royal Air Force

KILLED IN ACTION.—F/O. J. C. W. Walter.

PREVIOUSLY REPORTED MISSING, BELIEVED KILLED IN ACTION, NOW PRESUMED KILLED IN ACTION.—Act. Flt. Lt. J. W. Buckstone; Flt. Lt. H. Connolly; Sgt. K. D. Downing; Sgt. R. W. Johnson; Sgt. P. V. Parry; Sgt. K. J. Smith; Sgt. S. S. Waldman.

PREVIOUSLY REPORTED MISSING, NOW PRESUMED KILLED IN ACTION.—Sgt. N. F. Axford; Sgt. L. E. Billings; Sgt. W. G. Bond; Sgt. J. E. Burley; Sgt. V. J. A. Butler; Sgt. W. E. Chambers; Sgt. V. Comer; Sgt. E. C. Confait; P/O. C. Cresswell; Act. Sqn. Ldr. W. T. Davies, D.F.C.; P/O. S. W. Dodge; Sgt. H. Doughty; P/O. F. K. Doyle; Sgt. J. R. Elliott; Flt. Sgt. L. S. Franklin; Flt. Sgt. T. M. Gray; Sgt. R. G. Greenman; Sgt. J. K. Gregory; Flt. Sgt. L. Grundy; Act. Flt. Lt. W. J. E. Hagger; P/O. C. C. Hendley-Cross; Act. Flt. Lt. T. Hindle; F/O. G. C. Hooey, D.F.C.; Sgt. E. Jackson; Sgt. E. H. Kerry; Sgt. K. N. Killby; F/O. R. W. Lawrence; Sgt. H. J. Loveday; A/C.1 H. K. McCombie; L.A/C. G. McL.

McNeill; Sgt. E. W. McSparrow; Sgt. R. C. Martin; Flt. Sgt. A. McD. Milne; P/O. D. W. E. Morgan; Sgt. A. Morris; Sgt. F. A. Morris; Cpl. J. Rice; Sgt. H. C. Roake; P/O. E. J. Smither-man; Sgt. T. W. Soper; P/O. G. E. Tilling; P/O. J. H. Timmis; Flt. Sgt. A. H. Withers; Sgt. G. B. Wood; Sgt. P. T. Wright.

MISSING, BELIEVED KILLED IN ACTION.—Sgt. R. D. Benning; Sgt. L. V. C. Brooker; Sgt. F. R. Burton; Sgt. A. M. Coulthard; Sgt. J. Harrison; P/O. E. Hesketh; Sgt. T. Hughes; Sgt. T. J. Letbe; Sgt. A. Loudon; P/O. P. S. McCaughey; Sgt. D. H. MacTier; P/O. A. F. Paramore; Sgt. T. Pennock; Sgt. E. J. Trenise; Sgt. H. Wakefield; Sgt. R. D. Wood.

MISSING.—P/O. J. H. Abbott; F/O. J. Addison; P/O. P. B. Alcock; Wing Cdr. G. F. Alexander; Flt. Lt. R. Allanson; P/O. H. J. Allard; Sgt. E. J. Amos; Sgt. D. T. Anthony; Flt. Sgt. J. Appleton; Sgt. S. J. Argent; P/O. G. A. A. Armstrong; Sgt. J. D. Armstrong; Flt. Lt. R. W. Armstrong; P/O. D. B. Arnot; F/O. B. T. G. Arthur; P/O. T. G. D. Ashley-Cooper; P/O. H. F. Barclay; F/O. A. E. B. Barnard; P/O. G. C. Barnard; Flt. Lt. S. K. Barnes; Wing Cdr. G. B. M. Bell; Flt. Sgt. M. J. Bennett; P/O. W. G. Best; P/O. R. C. S. Bevan; P/O. A. W. Bird; P/O. F. E. Booy; Sgt. A. Bowers; Sgt. D. N. Bysouth; F/O. B. B. Callick; Flt. Lt. J. P. Carlile; P/O. A. G. F. Cheese-wright; P/O. F. J. S. Clayden; Sgt. D. H. Clennell; Sqn. Ldr. W. G. Clouston, D.F.C.; F/O. L. W. D. Clulee; Sgt. E. D. Cook; P/O. E. A. Coombes; Flt. Sgt. L. Copley; P/O. Q. D. G. Creegan; Sgt. L. R. Cunningham; Flt. Sgt. G. A. Davie; Act. Flt. Lt. R. W. Davis; Sgt. D. O. Dowson; Flt. Lt. J. O. Dykes; F/O. M. A. S. Elliot; Sgt. R. Elwell; Sgt. L. S. Fiddes; Sgt. D. F. Gage; P/O. R. H. Gibbs; Sgt. K. H. Golbold; Sgt. D'A. Gould; P/O. J. R. Graham; Sgt. R. T. C. Green; Flt. Sgt. S. Grundy; Sgt. N. F. Hallett; P/O. C. L. Hard; Sgt. W. H. Hargreaves; Sgt. J. Hence; Sgt. A. R. Hobbs; F/O. A. M. Houston; Sgt. J. R. Inglis; P/O. R. R. Johnston; P/O. L. H. Jolly; Sgt. D. V. Jones; P/O. D. A. King; Sgt. J. D. Law; Sgt. E. J. Letherbarrow; Sgt. F. Long; Sgt. R. W. Lowther; Sgt. J. Macaulay; P/O. G. S. Maclean; P/O. A. G. McPherson; Sgt. A. McVicar; Wing Cdr. H. J. Maguire; Sgt. R. J. Matthews; P/O. L. A. G. Morris; Sgt. G. Myers; Sgt. W. D. G. O'Brien; Flt. Lt. F. O'Driscoll; Sgt. L. A. Pestell; P/O. W. E. Pinder; P/O. R. V. C. Pleasance; Sgt. P. Plowright; Sgt. T. F. Richardson; F/O. H. H. Rogers, D.F.M.; Sgt. P. W. B. Sanderson; Sgt. G. A. Sherwood; P/O. B. J. Smith; Sgt. G. H. Smith; Wing Cdr. K. B. [redacted] Smith, D.S.O.; Sgt. P. A. Smith; Sgt. A. G. Stone; P/O. M. Taute; F/O. J. A. A. Tharp; Sgt. R. H. Thomas; Sgt. A. R. H. Thompson; Sgt. W. Thomson; F/O. A. J. Turner; Sgt. A. C. Wade; Flt. Sgt. T. K. Wagstaff; Sgt. J. Webb; F/O. D. W. Wheeler; Sgt. D. W. Williams; Sgt. N. H. Williams; Sgt. J. B. Woods; Act. Flt. Lt. R. N. Wyse.

KILLED ON ACTIVE SERVICE.—A/C.2 C. T. Clinnick; A/C.2 J. P. Exten; P/O. R. J. Fowles; L.A/C. F. Hughes; A/C.1 D. G. Jones; Sgt. A. B. Lewis; Cpl. R. Moss; A/C.1 R. Perry; A/C.2 W. Potts; Sgt. P. M. Rogerson; A/C.2 R. A. Sherwin; Sgt. A. K. Smith; L.A/C. W. C. Speirs; A/C.2 G. E. Stevenson; Flt. Lt. H. L. D. Tanner; Sgt. H. A. E. Wright.

PREVIOUSLY REPORTED MISSING, BELIEVED KILLED ON ACTIVE SERVICE, NOW PRESUMED KILLED ON ACTIVE SERVICE.—Flt. Lt. C. W. Grant.

PREVIOUSLY REPORTED MISSING, NOW PRESUMED KILLED ON ACTIVE SERVICE.—P/O. D. J. Whalley.

WOUNDED OR INJURED ON ACTIVE SERVICE.—Act. Wing Cdr. T. H. E. Edwards; L.A/C. F. A. Smith.

DIED ON ACTIVE SERVICE.—Sgt. G. Blakeley; Sgt. J. B. Boyd-Clark; L.A/C. D. H. France; W/O. W. Hoxley; A/C.1 W. H. Martin; Flt. Sgt. R. F. Oliver; L.A/C. C. H. J. Payne; Sgt. J. R. H. Rowe.

Royal Australian Air Force

KILLED IN ACTION.—Sgt. W. B. Ward.

PREVIOUSLY REPORTED MISSING, BELIEVED KILLED IN ACTION, NOW PRESUMED KILLED IN ACTION.—P/O. C. D. Kelly.

PREVIOUSLY REPORTED MISSING, NOW PRESUMED KILLED IN ACTION.—F/O. W. D. Blackstock; Sgt. N. Dan; Sgt. N. C. Darr; F/O. A. H. Durrell; Act. Sgt. K. T. Edwards; Flt. Sgt. J. A. Fiulay; P/O. J. M. Henderson; Sgt. A. J. Henry; Sgt. J. E. Hobgen; Sgt. T. C. Hobgen; Sgt. A. W. Howard; Sgt. L. W. H. Isle; Sgt. C. R. D. Lowis; Sgt. A. D. MacLeod; P/O. W. J. Mawdesley; A/C.1 L. T. Ogg; Sgt. R. A. Ponton; Sgt. K. A. Smith; F/O. J. L. Tully; Flt. Lt. E. St. C. Yeoman; P/O. I. C. Young.

MISSING, BELIEVED KILLED IN ACTION.—F/O. E. F. Appleton; P/O. A. J. Beer; F/O. W. R. Matheson; Sgt. L. F. Samson; Flt. Sgt. T. J. Wixted.

MISSING.—Flt. Sgt. D. T. Andrew; Flt. Sgt. H. Besley; Flt. Sgt. G. A. Foster; F/O. N. J. Ritchie.

PREVIOUSLY REPORTED MISSING, NOW REPORTED PRISONER OF WAR.—P/O. T. G. Wood.

Royal Canadian Air Force

PREVIOUSLY REPORTED MISSING, BELIEVED KILLED IN ACTION, NOW PRESUMED KILLED IN ACTION.—P/O. C. Kleckner; Sgt. R. D. Shortington.

PREVIOUSLY REPORTED MISSING, NOW PRESUMED KILLED IN ACTION.—P/O. C. R. Barr; Flt. Sgt. A. T. Johnstone; F/O. F. J. Kennedy; Flt. Sgt. H. N. Law; P/O. G. W. Murray; Flt. Lt. W. W. Murray; Flt. Sgt. T. L. J. Norrie; Sgt. J. J. Price; Sgt. F. J. B. Scrimes; Flt. Sgt. W. N. Shumsky; Flt. Sgt. C. H. Smith; Flt. Sgt. T. E. Turpin.

MISSING, BELIEVED KILLED IN ACTION.—Flt. Sgt. C. W. G. Burke; Sgt. J. H. Morris; Flt. Sgt. J. F. Smith.

MISSING.—Act. Flt. Lt. J. G. Binford; Flt. Sgt. F. Bemi; Sgt. W. Bodley; F/O. B. G. Cook; Flt. Sgt. L. R. Crowe; Flt. Sgt. D. F. Evans; P/O. D. Ferry; Sgt. W. S. Harris; P/O. A. R. Hickey; W/O. F. M. Holobow; Flt. Sgt. H. L. Huether; Sgt. P. J. Ireland; P/O. K. W. MacDonald; Sgt. A. B. McDonald; W/O. F. J. Morrow; Sgt. W. J. Reid; Sgt. C. F. Rimmer; Flt. Sgt. R. G. Rispin; Sgt. O. E. E. Schultz; F/O. L. N. Selthun; P/O. W. A. Walkinshaw; Sgt. D. C. Way.

KILLED ON ACTIVE SERVICE.—Sgt. A. A. Dorzek; Sgt. R. A. Killham; Sgt. A. N. MacLellan; Sgt. F. E. Rogers; Sgt. D. H. Smith; Sgt. J. O. T. A. A. G. Toupin.

PREVIOUSLY REPORTED MISSING, BELIEVED KILLED ON ACTIVE SERVICE, NOW PRESUMED KILLED ON ACTIVE SERVICE.—Sgt. G. J. Pearson; A/C.1 E. R. Watson.

WOUNDED OR INJURED ON ACTIVE SERVICE.—F/O. W. A. Sprinkle.

PREVIOUSLY REPORTED MISSING, NOW REPORTED PRISONER OF WAR.—Flt. Lt. D. R. Morrison, D.F.M.

Wing Cdr. R. W. Reynolds, D.S.O. and Bar, D.F.C., greeted by Sqn. Ldr. V. R. G. Harcourt, D.F.C., on taking over No. 139 squadron, who fly Mosquitoes.

Royal New Zealand Air Force

KILLED IN ACTION.—F/O. N. B. Daniel.

PREVIOUSLY REPORTED MISSING, BELIEVED KILLED IN ACTION, NOW PRESUMED KILLED IN ACTION.—Sgt. A. W. O'Dowd.

PREVIOUSLY REPORTED MISSING, NOW PRESUMED KILLED IN ACTION.—Sgt. A. W. Corby; Sgt. J. A. Glynn; Flt. Sgt. S. B. Goord; F/O. J. Pybus; Sgt. R. F. Whitten.

MISSING.—Sgt. T. W. J. Denholm; P/O. J. K. Grainger; Sgt. I. Griffiths; P/O. D. G. McCaskill; Sgt. W. J. McErlich; Sgt. J. G. Morgan; Sgt. F. A. Partridge; Sgt. J. W. Smith; Sgt. R. A. Smith; P/O. W. G. Sweney; Sgt. G. A. Taylor.

KILLED ON ACTIVE SERVICE.—F/O. G. G. Thomas.

WOUNDED OR INJURED ON ACTIVE SERVICE.—W/O. T. W. Burke.

Casualty Communiqué No. 245.

Of the names in this list 100 are second entries giving later information of casualties published in earlier lists.

Royal Air Force

KILLED IN ACTION.—Sgt. E. H. Fletcher; F/O. S. J. Lupton; Sgt. B. Oldroyd; Flt. Sgt. H. A. Payze; P/O. R. W. Thompson.

PREVIOUSLY REPORTED MISSING, BELIEVED KILLED IN ACTION, NOW PRESUMED KILLED IN ACTION.—Sgt. F. R. Arthan; Sgt. W. Brookes; Flt. Sgt. W. Carmichael; Sgt. J. W. Cook; Sgt. W. G. Cormack; Sgt. J. Davison; Sgt. G. F. Dunks; Act. Flt. Lt. N. J. Edwards; P/O. V. E. G. Goss; Sgt. T. B. Keegan; Sgt. E. McDonald; Sgt. R. McGlen; Sqn. Ldr. D. D. Pryde, D.F.C.; Sgt. G. T. Reid; Sgt. L. V. Schafer; Sgt. W. Thompson; Sgt. D. E. West.

PREVIOUSLY REPORTED MISSING, NOW PRESUMED KILLED IN ACTION.—Flt. Sgt. T. D. Atkinson; Sgt. A. T. Bennett; Sgt. J. E. Bottomley; Sgt. L. E. Clarke; Sgt. G. Clelland; Sgt. F. G. Crighton; Sgt. J. Croll; Sgt. D. W. Drew; P/O. R. C. Eldridge; Sgt. H. R. G. D. Elliott; Sgt. E. E. C. Evans; P/O. R. W. Freiberg; Sgt. G. B. Gane; Sgt. C. J. M. Hall; Sgt. J. A. E. Hann; Sgt. R. K. Helyer; Sgt. E. Hollows; Sgt. R. D. Horder; Sgt. W. E. Horsfall; Sgt. S. G. Kerr; Sgt. R. Kitchen; Flt. Sgt. H. J. Lambeth; Flt. Sgt. L. J. Lea; Sgt. R. J. Lees; Sgt. J. A. Lloyd; Sgt. R. G. McCrory; P/O. D. G. McLaren; Sgt. A. Marland; Sgt. A. Moorcroft; Sgt. E. J. Morris; Sgt. L. Musitano; Sgt. A. Nightingale; Sgt. S. F. Parker; Act. Sqn. Ldr. G. A. Powell, D.F.M.; Flt. Sgt. R. J. Preston; Flt. Sgt. G. J. Sharman; Sgt. C. Stephenson; Sgt. J. Strang; Sgt. N. F. Webber; Sgt. J. Whitfield; P/O. G. Whittaker, D.F.M.; P/O. F. G. Zavakos.

WOUNDED OR INJURED IN ACTION.—P/O. E. V. Domane; Sgt. R. G. Kelly.

DIED OF WOUNDS OR INJURIES RECEIVED IN ACTION.—Flt. Sgt. R. S. Hills.

MISSING, BELIEVED KILLED IN ACTION.—Flt. Sgt. J. F. Austin; P/O. R. Brown; Sgt. J. L. Cartmel; P/O. F. D. Clarke; F/O. H. E. Clement; Sgt. I. R. Elliot; F/O. J. M. Everill; Sgt. J. R. Gurdon; Sgt. R. G. Hamilton; Sgt. N. J. McSwiney; Sgt. G. W. H. Northover; Sgt. A. Ottolangui; Sgt. N. S. Pinkney; F/O. N. Snowden; Sgt. P. D. Steed; Flt. Sgt. J. Stupart; Sgt. F. Wood; P/O. W. H. Young.

MISSING.—Sgt. J. V. Avery; P/O. R. J. Beldin; Sgt. W. E. Bidmead; Sgt. S. Biggs; Sgt. W. Boddy; Flt. Sgt. F. J. Britton; Sgt. T. L. Brown; Sgt. J. C. Cash; Sgt. J. J. Courtney; Sgt. C. L. Cruttenden; Sgt. A. N. Dent; Sgt. H. C. Dent; Sgt. R. E. Dutton; Sgt. G. Evans; Sgt. R. Farnsworth; Act. Sqn. Ldr. M. Foulis, D.F.C.; Sgt. J. L. Goldsmith; Sgt S. F. Gould; Sgt. T. E. Hall; Sgt. S. Hammond; Sgt. R. W. Harley; Sgt. L. F. J. Harris; Sgt. L. O. Harrison; Flt. Sgt. F. Hay; Sgt. A. Holden; P/O. F. J. Hudson; Sgt. P. H. R. Hunt; Sgt. R. V. Jennings; Sgt. A. E. Jones; Sgt. R. A. Kirkin; Sgt. J. D. Lindrea; Act. Sqn. Ldr. R. H. Lunney, D.F.C.; Sqn. Ldr. R. W. McCarthy; Sgt. H. N. McKinnon; Sgt. V. J. Merefield; Sgt. H. Noar; Sgt. J. H. Nunn; Sgt. E. M. Offen; Sgt. E. A. Oilling; Flt. Sgt. T. G. O'Shaughnessy; Sgt. R. J. Palmer; Sgt. G. E. Pascoe; Sgt. T. H. Page; F/O. G. W. Pain, D.F.C.; Sgt. A. Penlington; P/O. L. Powell; Sgt. E. A. Raby; Sgt. H. J. D. Rowse; F/O. E. H. Scott; Sgt. E. A. Shaw; Sgt. T. Shepherd; Sgt. N. Shield; Sgt. W. F. Shields; Act. Flt. Lt. R. J. Shuttlebotham; Sgt. B. A. C. Spranger; Sgt. L. Tagg; P/O. J. T. R. Taylor; F/O. L. E. Thompson; P/O. A. F. Towers; Sgt. G. P. Tyrer; Act. Flt. Sgt. F. W. Vincent; Sgt. D. Vollans; Sgt. G. Wade; Flt. Sgt. E. Waters; Sgt. F. G. A. Weight; P/O. R. E. Wilkes; Sgt. J. W. Williams; Sgt. W. F. Whitfield; P/O. S. H. West.

KILLED ON ACTIVE SERVICE.—F/O. J. H. Barnes; Cpl. A. Blackburn; L.A/C. J. G. Buchanan; L.A/C. R. A. Cozens; L.A/C. A. Crawford; Sgt. J. E. Franckeiss; Flt. Sgt. A. R. Garrood; F/O. C. W. G. Gray; F/O. J. M. Hadow; Sgt. J. H. Hicken; L.A/C. R. B. Horn; L.A/C. S. R. Hughes; Sgt. D. J. Lloyd; Sgt. J. McKinstry; Sgt. C. Marr; P/O. J. S. Messent; L.A/C. R. A. Miller; F/O. A. A. Perrott; P/O. J. S. Peterkin; F/O. J. G. Rappoport; L.A/C. C. V. Smith; L.A/C. G. W. Tarbath; Sgt. C. F. Taylor; F/O. D. E. Thwaites; F/O. L. A. Walker; Sgt. W. J. Whittaker.

PREVIOUSLY REPORTED MISSING, BELIEVED KILLED ON ACTIVE SERVICE, NOW PRESUMED KILLED ON ACTIVE SERVICE.—Sgt. G. Howell.

PREVIOUSLY REPORTED MISSING, NOW PRESUMED KILLED ON ACTIVE SERVICE.—Sgt. S. E. Hunt; Sgt. A. M. Hunter; Sgt. J. A. Nelson.

WOUNDED OR INJURED ON ACTIVE SERVICE.—L.A/C. G. H. Beggs; F/O. H. J. Dee; Sgt. H. F. Hulse; L.A/C. D. A. Phipp; Flt. Sgt. C. C. Povey; L.A/C. H. Salmon; Sgt. A. G. Taylor; P/O. G. N. E. Yeates.

DIED OF WOUNDS OR INJURIES RECEIVED ON ACTIVE SERVICE.—Sgt. R. Hulme.

DIED ON ACTIVE SERVICE.—A/C.2 T. R. Cumming; A/C.1 E. H. Godsell; Cpl. B. Harwood; Cpl. C. E. Holmes; L.A/C. H. J. Laidler; Sgt. R. H. M. Thomas.

Royal Australian Air Force

PREVIOUSLY REPORTED MISSING, NOW PRESUMED KILLED IN ACTION.—F/O. R. W. Brown; Sgt. N. M. Hardy; Sgt. R. L. Hugall; Sgt. F.

SERVICE AVIATION

SERVICE AVIATION

D'O. Hunter; Sgt. E. G. Johnson; Act. Flt. Lt. V. F. Keyser; Sgt. S. Levitus; Sgt. J. W. Lindsay; F/O. J. B. Maher; Sgt. J. S. Peters; Sgt. A. C. Schofield; Sgt. L. C. Thompson.

MISSING.—Flt. Sgt. M. A. E. Bradford; Sgt. J. W. Campbell; F/O. J. R. Henderson; Flt. Sgt. W. J. Larcombe; Flt. Sgt. M. F. Lay; F/O. R. Wheatley.

DIED ON ACTIVE SERVICE.—Sgt. K. H. Hewitt.

Royal Canadian Air Force

KILLED IN ACTION.—Sgt. R. M. Buie; Sgt. A. W. Kimmerly; Flt. Sgt. L. K. Taylor.

PREVIOUSLY REPORTED MISSING, BELIEVED KILLED IN ACTION, NOW PRESUMED KILLED IN ACTION.—P/O. C. J. Porter.

PREVIOUSLY REPORTED MISSING NOW PRESUMED KILLED IN ACTION.—Flt. Sgt. R. L. Bradshaw; Flt. Sgt. R. J. Chisholm; Act. Flt. Lt. J. L. H. Elliott; P/O. E. W. Gillespie; W/O. K. L. McDowell; Sgt. W. Peebles; Sgt. L. O. Scott; Sgt. B. Strachan; P/O. T. J. Taylor; Sgt. T. J. Thomas; Sgt. W. Thomson; Flt. Sgt. C. P. Veysey; Sgt. W. H. Webster.

MISSING, BELIEVED KILLED IN ACTION.—Act. Sqn. Ldr. D. G. E. Ball; Flt. Sgt. R. S. Birks; W/O. A. L. Foster; Sgt. T. E. Richardson.

MISSING.—Sgt. L. W. Bartman; Sgt. R. B. Blake; Sgt. G. A. Booth; F/O. S. Brown; Sgt. A. J. Burwell; F/O. E. N. Cluderay; Sgt. A. J. Cockaday; F/O. G. C. Crowther; F/O. J. O. L. Desroches; P/O. A. T. Doucette, D.F.C.; F/O. A. H. Gipson; Sgt. E. H. Ingram; P/O. T. R. C. Irwin; Act. Flt. Lt. W. T. Johnstone; P/O. G. P. H. Ledoux; Sgt. I. R. MacDonald; Sgt. R. McEwan; Flt. Sgt. D. K. Nolan; P/O. G. M. Parkinson; Sgt. R. F. C. Porter; P/O. J. A. Simpson; F/O. D. M. Swanson; Act. Sqn. Ldr. F. V. Taylor; Flt. Sgt. P. P. Trudeau; P/O. L. E. Usher.

KILLED ON ACTIVE SERVICE.—Sgt. R. E. Clark; F/O. R. C. Field; Sgt. H. F. Puder.

WOUNDED OR INJURED ON ACTIVE SERVICE.—F/O. E. Richardson.

Royal New Zealand Air Force

KILLED IN ACTION.—Sgt. J. A. Horgan.

PREVIOUSLY REPORTED MISSING, BELIEVED KILLED IN ACTION, NOW PRESUMED KILLED IN ACTION.—P/O. D. O. Waters.

PREVIOUSLY REPORTED MISSING, NOW PRESUMED KILLED IN ACTION.—F/O. H. R. Blake, D.F.C.; Sgt. J. G. Hegan; F/O. N. E. Hodson; Sgt. L. G. Knight; Sgt. M. G. McGregor; Sgt. E. F. S. Moncrief; P/O. W. J. Monk; Sgt. D. H. Randle; Flt. Sgt. D. H. Reed; Sgt. J. C. Roy.

MISSING.—Flt. Sgt. S. G. Cottrell; P/O. S. N. Cross; Sgt. E. H. Lankshear; P/O. J. O. B. Mooney; Sgt. N. Morley.

WOUNDED OR INJURED ON ACTIVE SERVICE.—Sgt. A. E. W. Day; F/O. V. E. Mitchell.

Casualty Communiqué No. 246.

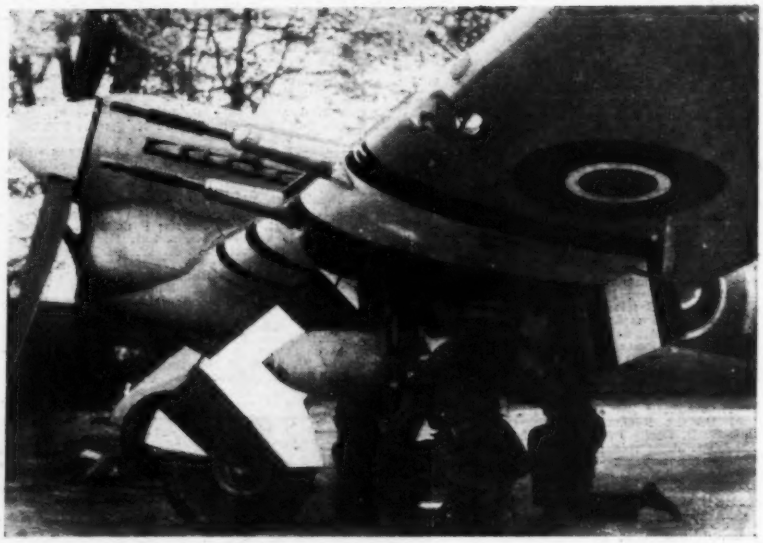
Of the names in this list 106 are second entries giving later information of casualties published in earlier lists.

Royal Air Force

KILLED IN ACTION.—Sgt. V. R. Ager; Sgt. G. A. Bristow; Sgt. R. Brough; P/O. V. Cook; Sgt. G. W. J. Davison; Sgt. T. Fee; Sgt. E. J. Field; Sgt. D. S. Peters; Sgt. J. Smith; Sgt. H. R. Staines; Sgt. F. G. Wilkins.

PREVIOUSLY REPORTED MISSING, BELIEVED KILLED IN ACTION, NOW PRESUMED KILLED IN ACTION.—P/O. A. Ainslie; Flt. Lt. N. G. R. Booth; Sgt. J. B. Butterworth; Sgt. M. C. Davies; P/O. W. G. Elby; Act. Sqn. Ldr. J. C. Hall, D.F.C.; Sgt. H. D. Hurst; Sgt. W. Kendall; Sgt. P. A. Lashly; Sgt. R. Maycock; Sgt. R. Nicholson; Sgt. F. L. Sharp; P/O. N. Spark; Sgt. A. Spriggs; Sgt. M. E. Wheatcroft; Flt. Sgt. A. F. C. Wise.

PREVIOUSLY REPORTED MISSING, NOW PRESUMED KILLED IN ACTION.—Sgt. C. A. G. Armstrong; Sgt. S. Arnett; Sgt. S. R. Ashton; Sqn. Ldr. J. Beavis; Sgt. R. E. Bedford; F/O. L. M. Blain; Flt. Sgt. F. Booth; Act. F/O. H. J. Bullock; Sgt. C. J. Bunn; Sgt. D. P. Byrne; Sgt. B. Cain; Flt. Sgt. J. D. Cameron; P/O. J. P. D. Clarke; Flt. Sgt. S. A. Coombs; Sgt. W. L. Crowther; Sgt. L. Davis; Sgt. I. MacL. Dawson; Sgt. A. T. Drysdale; P/O. R. C. Embelin; Sgt. A. D. Evans; Sgt. C. Evans; Sgt. H. W. Hall; Sgt. R. D. Holland; Sgt. H. Holmes; Sgt. T. Howarth; Sgt. J. E. Howell; Sgt. E. L. Jackman; Sgt. G. Jefferies; Sgt. G. F. Jenkins; Wing Cdr. C. H. Jones, D.F.C.; Sgt. J. K. Knight; Sgt. J. Lewis; Sgt. J. McIntyre; Sgt. P. McKenny; Sgt. K. McLennan; Flt. Sgt. J. Martin; Flt. Sgt. C. J. Matthews; P/O. V. Moss; Sgt. J. Newton; Sgt. J. O. H. Nichols; Sgt. R. W. Page; P/O. A. G. Powell; Sgt. A. Prince, D.F.M.; P/O. J. K. Punshon; Wing Cdr. W. Riley, D.F.C.; Sgt. L. H. Roberts; Sgt. J. Rutherford; P/O. V. W. Saul; Sgt. S. A. G. Shaw; Sgt. B. Shepherd; P/O. T. B. Skinner; Sgt. R. F. Stainforth; Sgt. N. C. Stocker; W/O. J. W. D. Sykes; P/O. D. H. R. Tallis, D.F.M.; Sqn. Ldr. J. St. J. Thomson; Flt. Sgt. K. M. Waylett; Sgt. J. S. Weaver.



DOUBLING THE PUNCH : Fitting a 500lb. bomb to the wing racks of a Typhoon.

WOUNDED OR INJURED IN ACTION.—Flt. Lt. K. A. Perkin.

DIED OF WOUNDS OR INJURIES RECEIVED IN ACTION.—Sgt. J. Beatson.

MISSING, BELIEVED KILLED IN ACTION.—Act. Flt. Lt. J. W. N. Bailey; Sgt. T. Crossland; Flt. Sgt. A. Greene; Sgt. R. W. Hedicker; Act. Flt. Lt. C. H. S. Kirkus; Sgt. T. S. McStay; Sgt. J. W. R. H. Woodley.

MISSING.—P/O. R. C. Abrams; Act. Flt. Lt. S. J. D. Acland; Sgt. J. G. Adam; F/O. W. E. Alexander; Sgt. A. Anderson; Flt. Lt. J. W. Appleton; P/O. J. H. Bairstow; Sgt. G. Barclay; Flt. Sgt. J. R. Barnley; F/O. K. A. Barrett; Sgt. G. Boulton; Sgt. S. H. C. Brown; Sgt. M. C. Burgoine; F/O. H. H. J. Cadell; Flt. Lt. G. Carr; Sgt. E. Carter; P/O. R. V. Carter; P/O. F. B. Cattle; P/O. D. J. D. Chitty; Sgt. B. J. Clingine; Sgt. W. A. Cook; Sgt. G. H. Cruxton; Sgt. L. Denby; Sgt. J. Douglas; Flt. Lt. A. P. Dowse, D.F.C.; P/O. A. V. Evans; Sgt. G. J. Evans; Sgt. N. L. Fairhurst; Sgt. K. R. Faulconbridge; Sgt. G. Fellows; Sgt. F. C. Fidgeon; Sgt. A. Ford; Sgt. T. C. J. Grist; Flt. Lt. J. R. Harries; P/O. P. Harvey; Sgt. W. P. Heyworth; Sgt. A. W. Hoare; Sgt. F. E. Holmes; P/O. L. H. Holmes; Sgt. G. W. Houlistoo; P/O. J. Howard-Bangs; Sgt. W. A. W. Hunter; Sgt. W. J. Jackson; Sgt. L. Jones; Sgt. T. Jopling; F/O. C. P. King, D.F.M.; Sgt. R. W. Lambert Flt. Lt. T. S. Lea; F/O. E. C. Lee-Brown; Sgt. D. Lenahan; Sgt. D. W. Lewis; Sgt. A. Longstaffe; Sgt. J. F. McNeill; Sgt. R. B. McPherson; Sgt. S. Moseley; Sgt. A. McK. Munn; Sgt. R. Newdick; Flt. Sgt. J. J. O'Brien, D.F.M.; P/O. T. G. Ogle; Sgt. J. J. O'Hagan; Sgt. S. F. Osmond; Sgt. B. W. A. Perry; Sgt. F. C. Robinson; Act. P/O. P. Roe; Sgt. G. D. W. Scholes; Sgt. L. H. Shackleton; Sgt. T. T. Slater; P/O. J. Smart; Sgt. P. T. Smith; Flt. Sgt. W. Stephen; Sgt. J. Strachan; F/O. F. H. Street; Sgt. H. Telfer; Flt. Sgt. B. L. Thomas; Sgt. H. E. Thompson; Sgt. V. J. Upson; Sgt. H. Walters; Sgt. J. Warnes; Sgt. B. W. E. Wedderburn; Flt. Sgt. R. J. White; Sgt. J. Wright.

KILLED ON ACTIVE SERVICE.—Sgt. C. R. Archer; Sgt. A. Brown; Flt. Sgt. E. Cooke; Sgt. B. F. Cornhill; Sgt. A. W. Frapwell; Sgt. C. Harrison; Sgt. H. B. Harrison; Sgt. D. M. Homer; Sgt. S. Levitus; Sgt. D. B. McCartney; Sgt. A. E. Martin; F/O. L. H. Page; P/O. E. G. Siberry; Flt. Lt. T. C. Stanbury.

PREVIOUSLY REPORTED MISSING, BELIEVED KILLED ON ACTIVE SERVICE, NOW PRESUMED KILLED ON ACTIVE SERVICE.—Sgt. C. Carling.

DIED ON ACTIVE SERVICE.—P/O. S. W. Clark; A/C.2 G. C. Coupland; Cpl. A. Coyle; L.A/C. T. J. Dunn; A/C.2 T. J. Fletcher; L.A/C. W. H. Flood; L.A/C. F. A. Harris; Flt. Sgt. A. J. Hayter; L.A/C. L. S. Hirons; A/C.1 C. E. Hole; Sgt. E. Jackson; A/C.2 F. H. Johnson; A/C.1 F. Keller; Sgt. R. F. Lea; A/C.1 D. Lumsden; L.A/C. S. Nicol; A/C.2 R. V. Parker; L.A/C. W. G. T. Pettle; A/C.1 L. C. Sabey; A/C.2 F. J. Sanders; L.A/C. F. W. Shrubsole; L.A/C. W. T. Smart; A/C.2 K. Speak; Sgt. R. B. Stanley; L.A/C. G. W. Sutcliffe; A/C.2 W. N. Turnbull; A/C.2 M. T. Vowles; L.A/C. A. Walters; Cpl. K. R. Whittaker.

PREVIOUSLY REPORTED MISSING, NOW REPORTED PRISONER OF WAR.—P/O. K. R. Bowhill; Sgt. A. W. Butteriss; L.A/C. J. Heron; Flt. Sgt. E. A. Linforth; Sgt. F. Rawson; L.A/C. T. S. Tapley; Sgt. R. Waterworth.

Royal Australian Air Force

PREVIOUSLY REPORTED MISSING, NOW PRESUMED KILLED IN ACTION.—Sgt. F. A. Nurvey.

MISSING, BELIEVED KILLED IN ACTION.—Sgt. P. F. Burroughs.

MISSING.—Sgt. J. H. Ball; Flt. Sgt. A. A. Garven; F/O. B. P. Jay.

KILLED ON ACTIVE SERVICE.—Sgt. A. E. Britten Jones.

WOUNDED OR INJURED ON ACTIVE SERVICE.—St. F. T. J. De W. Gloster.

DIED ON ACTIVE SERVICE.—Sgt. E. J. M. Riordan.

PREVIOUSLY REPORTED MISSING, NOW PRESUMED KILLED ON ACTIVE SERVICE.—Sgt. S. K. Annesley.

Royal Canadian Air Force

KILLED IN ACTION.—Sgt. J. A. Lemmerick; Sgt. A. A. Moore.

PREVIOUSLY REPORTED MISSING, BELIEVED KILLED IN ACTION, NOW PRESUMED KILLED IN ACTION.—Flt. Sgt. J. L. Blair; Sgt. L. F. Cooke; Sgt. J. M. Dunlop; Sgt. F. W. Kidson; P/O. J. S. Lawson; Flt. Sgt. A. B. McLellan; P/O. L. Poch; Sgt. J. H. B. Woolgar.

PREVIOUSLY REPORTED MISSING, NOW PRESUMED KILLED IN ACTION.—Flt. Sgt. T. R. Cattle; P/O. P. B. L. Evans; P/O. D. A. Felt; W/O. F. A. Holmes; P/O. G. C. Hooper; Flt. Sgt. D. C. Imeson; Sgt. G. M. Lantz; Sgt. A. A. Margrett; Flt. Sgt. H. H. Marks; Flt. Sgt. W. G. Yorke.

MISSING, BELIEVED KILLED IN ACTION.—Flt. Sgt. J. W. Toon.

MISSING.—P/O. D. E. Bruce; Sgt. E. R. Carvajal; P/O. G. W. Elliott; F/O. D. C. Fennah; Sgt. J. W. Gibson; F/O. C. O. Hatle; P/O. R. J. Howard; Sgt. L. N. Jonasson; Sgt. W. G. Kapuscinski; P/O. E. Kitt; Sgt. R. M. Mayberry; P/O. E. M. Merritt; P/O. T. H. O'Connell; Sgt. H. Richmond; Sgt. F. O. Ross; P/O. J. L. Rossignol; Sgt. A. A. Tschantre.

KILLED ON ACTIVE SERVICE.—Sgt. W. A. Dixon; P/O. J. A. Town.

PREVIOUSLY REPORTED MISSING, NOW PRESUMED KILLED ON ACTIVE SERVICE.—Sgt. E. J. F. Paquette.

Royal New Zealand Air Force

KILLED IN ACTION.—W/O. J. A. E. Walsh.

PREVIOUSLY REPORTED MISSING, NOW PRESUMED KILLED IN ACTION.—Flt. Sgt. I. W. Davies; Flt. Sgt. A. I. Smith; Sgt. N. E. Whiting.

MISSING.—Flt. Sgt. R. R. Campbell; Flt. Sgt. W. Hornung; Flt. Sgt. A. J. Milner.

KILLED ON ACTIVE SERVICE.—Sgt. L. J. Ayers.

South African Air Force

KILLED IN ACTION.—Lt. L. P. Carlisle; Lt. A. D. Carter; Flt. Sgt. S. Lentin; Flt. Sgt. E. Robinson.

MISSING.—Capt. D. C. Laugscher.